Chapter Two

Invitation to Struggle: The History of Civilian-Military Relations in Space

by Dwayne A. Day

The history of American civilian and military cooperation in space is one of competing interests, priorities, and justifications at the upper policy levels, combined with a remarkable degree of cooperation and coordination at virtually all operational levels. It is a history of the evolution of responsibility for space exploration. Both the Eisenhower and Kennedy administrations gradually decided which organization should be responsible for which activities, eventually establishing these responsibilities as fact. This process did not result in a smooth transition; first the Army and then the Air Force saw its hopes for assuming the predominant role in space exploration subsumed to larger national priorities. It proved to be most painful for the Air Force, which had the biggest dreams for space and saw them dashed as NASA achieved all of the glory during the Cold War space race.

This history can be separated into two broad eras—cooperation prior to NASA's creation and cooperation between NASA and the Department of Defense (DOD), with a transition period in between. This transition is an aspect that is frequently overlooked in discussions of the subject, for civil-military cooperation in space did not begin with the establishment of NASA—it *changed* with the creation of NASA, and it did so dramatically. Prior to NASA's establishment, the military had had the upper hand in determining *all* space priorities, and civilian interests, when considered at all, were clearly secondary. There were also multiple military space actors—primarily the Air Force and the Army—and it was not clear which would emerge dominant. After NASA was created, the Army space program largely disappeared—being subsumed by NASA. The Air Force became the dominant military space actor and often found itself playing a secondary, supporting role to the civilian program.

This history is also the history of the evolution of an idea—that space exploration, particularly human exploration, should be a civilian pursuit. Throughout history there is ample precedent for both civilians and the military undertaking exploratory missions with government support, but early American plans for human space exploration centered on military missions. Wernher von Braun's wheeled space station and planned trips to the Moon all involved the use of military crews in what were envisioned as essentially military missions. The popular culture of the day echoed this vision, as in B-grade science fiction films such as *Project Moonbase* and *The Conquest of Space*. Also, science fiction and pseudo-news articles depicted a military space force dedicated to conquering the heavens. Human space exploration seemed, at least in much of the popular consciousness, to be a logical evolution of existing military missions and an extension of the idea of military pacification of the frontier. Certainly, this was the view of the uniformed leadership of the Air Force immediately after Sputnik.

Reality was to prove to be more complex and more nuanced than the popular vision, however, in large part because of the desire to make the American space program stand as a positive, peaceful beacon for Western-style democracy. The U.S. Air Force strove to

find a military mission for humans in space. It could not. Once the two main reasons to place humans in space—science and prestige—became civilian pursuits, the Air Force, after more than a decade trying, could find no cost-effective reason to place humans in orbit.

The idea that there was no role for military officers in space found resistance within the Air Force, which tried unsuccessfully to portray space as merely an expansion of its current operating realm. Prior to Sputnik, there was only limited enthusiasm within the Air Force for space programs and expenditures. There was a core group of space enthusiasts within the Air Force, but they lacked both authority and resources. After Sputnik, the top brass—particularly the Air Staff—embraced space, with a strong emphasis on human spaceflight. But it did so at precisely the same time that the political wind was shifting, and human spaceflight was determined to be better as a civilian, rather than a military, mission.

This essay also highlights the difference between the civilian and uniformed leadership of the military—particularly in the Air Force. Throughout the 1945-1988 period, both the civilian and uniformed leaders of the Air Force made major decisions concerning space, but most of the major policy decisions were made by the civilian leadership, not those in uniform, who had different priorities, biases, and interests.

Yet one of the important differences to note is that the uniformed officers represent the institutional memory of a military service. Secretaries of DOD, service secretaries, and undersecretaries come and go, making decisions during their reign of which they usually do not have to bear the consequences later. But military officers—particularly mid-ranking officers hoping to make general officer rank—often see the decisions get made, are responsible for implementing them, and then have to live with the consequences as they rise up through the ranks. The result is that uniformed officers may eventually resent decisions made by civilian officials long before their time; this can color their outlook as they rise to leadership positions. There is no better example of this than the Space Shuttle experience, which continues to shape NASA-DOD relations to this day.

Finally, this is a history of the attention to, and ignorance of, the issue of duplication by the civilian and military space programs. Virtually every presidential administration has referred to the "national space program" as if the separate civilian, military, and intelligence space programs were part of a unified whole. This was certainly the intent of the Eisenhower administration. But the creation of NASA itself duplicated missions that were already being addressed by DOD. Other policy decisions, such as giving NASA its own rocket development capability, created further redundancy.

This issue really came to the fore during the Kennedy administration. Secretary of Defense Robert S. McNamara sought to eliminate duplication among the parts of the "national space program," but with only limited success—killing the Dyna-Soar space plane while attempting to reduce duplication between DOD and civilian organizations, such as NASA and the Central Intelligence Agency (CIA). However, while he attempted to reduce duplication in certain aspects, McNamara allowed further divergence on rocket development. Finally, perhaps the biggest attempt to eliminate the duplication of functions—the Space Shuttle—failed spectacularly at that task and made the future convergence of military and civilian functions all the more difficult.

The First Era—Pre-NASA

The true genesis of the U.S. military space program predates Sputnik and even predates the well-known V-2 rocket research at White Sands at the end of World War II. American military rocket research began at the Guggenheim Aeronautical Laboratory at the California Institute of Technology (GALCIT), under Frank Malina, Hsue-shen Tsien, and others in the late 1930s and early 1940s.[1] Malina and Tsien speculated about the possibilities of ballistic missiles at GALCIT, an Army laboratory renamed the Jet Propulsion Laboratory (JPL) in 1943. But the U.S. military chose not to follow the German path of investing heavily in an immature technology with only limited immediate payoff. Instead, the military focused research on the development of a much more promising weapon, the atomic bomb.[2] As a result, U.S. rocket research during the war centered on more immediate and practical, if rather mundane, applications, such as short-range rocket projectiles and the misnamed jet-assisted takeoff (JATO) rockets for heavily laden aircraft.

In the immediate post-war years, the U.S. military conducted extensive research with captured German rocket technology. It was during this time that a precedent was established that would have a significant impact a decade later. Colonel Holger Toftoy, chief of the Army Ordnance Enemy Equipment Intelligence Section, had acquired the parts and documentation to assemble more than 100 captured V-2 rockets. Toftoy invited scientists from various organizations to participate in V-2 launches by providing test payloads and instrumentation for everything from upper atmosphere research to radio and radar propagation experiments.[3] The field of rocketry was so new that basic research was a high priority and the involvement of scientific groups was only natural. Out of this emerged the precedent for civilian government scientists to provide scientific payloads for military rockets, and indeed this was the genesis of a U.S. space science community.

Close military-civilian cooperation in basic research in many fields was a result of World War II, and a number of government-university research centers evolved. In the aviation field, the military already had a long track record of working with the civilian National Advisory Committee for Aeronautics (NACA). The military—primarily the U.S. Air Force—conducted a large number of aeronautics test and development projects with NACA throughout the 1950s.

It was from this early cooperation on space and aeronautics-related research that the NASA-military relationship was to expand and evolve. But early American proposals for the development of satellites and rockets were entirely military in nature.

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1. An early GALCIT report can be found as Document I-12 in Volume I of this series. See John M. Logsdon, gen. ed., with Linda J. Lear, Jannelle Warren-Findley, Ray A. Williamson, and Dwayne A. Day, *Exploring the Unknown: Selected Documents in the History of the U.S. Civil Space Program, Volume I: Organizing for Exploration* (Washington, DC: NASA Special Publication (SP)-4407, 1995), 1: 153-76.

2. For a discussion of the limited military utility and tremendous drain on German resources of the V-2, see Michael J. Neufeld, *The Rocket and the Reich: Peenemünde and the Coming of the Ballistic Missile Era* (New York: Free Press, 1995).

3. David H. DeVorkin, *Science With a Vengeance: How the U.S. Military Created Space Sciences After World War II* (New York: Springer-Verlag, 1992), pp. 59-61. See also Homer E. Newell, *Beyond the Atmosphere: The Early Years of Space Science* (Washington, DC: NASA SP-4211, 1980).

The Air Force and Army Space Studies

In May 1945, German rocket expert Wernher von Braun, who was brought to the United States after the war, prepared a report for the U.S. Army discussing the potential of Earth-orbiting satellites. In October, the U.S. Navy proposed its own satellite. In November, Army Air Force General H. H. "Hap" Arnold declared that a spaceship was entirely "practicable today."[4]

On April 9, 1946, the Army-Navy Aeronautical Board discussed the subject and decided to reconsider it a month later on May 14. Immediately after the first meeting, Major General Curtis E. LeMay, Director of Research and Development of the Army Air Forces, decided to commission an independent study of the issue. It was to be a three-week crash effort to return a report before the second Aeronautical Board meeting, apparently with the intention of securing this new field for the Army Air Forces.

Project RAND, a division of Douglas Aircraft Company's Santa Monica research laboratories, which had been established to serve as a "think tank" for the Army Air Forces, was given the responsibility for the satellite study. The result was the report titled "Preliminary Design for an Experimental World Circling Spaceship," issued on May 2, 1946. This was RAND's first study. In 324 pages, it concluded that it was entirely possible, using existing technology, to develop a satellite system, although the payload would be limited to less than 2,000 pounds. The satellite could be used to gather scientific information, as well as to conduct weather reconnaissance, weapons delivery, attack assessment, communications, and "observation." The report further noted that "the satellite offers an observation aircraft which cannot be brought down by an enemy who has not mastered similar techniques."[5]

If LeMay's concern had been to maneuver the Navy out of the satellite business, his tactic apparently worked, for Navy efforts soon disappeared. However, while the first study had concluded that a satellite vehicle was practical, it failed to create any great enthusiasm for it in the Army Air Forces, which did not want to ignore the possibilities of satellites—particularly for satellite reconnaissance—but was unwilling to pursue it in any meaningful way. The Army Air Forces ordered a second study, and RAND produced a series of documents on the subject during the winter of 1946-1947. One document noted that a satellite in polar orbit would be ideal for scanning the oceans for ships. Another noted that a satellite equipped with television equipment and one or more cameras could be used for reconnaissance. In September 1947, the Air Staff of the newly formed Air Force ordered the Air Materiel Command to evaluate RAND's studies. The Air Materiel Command returned a cautious report noting that the practicality of such systems was questionable and recommended a further study to establish Air Force requirements.[6]

In January 1948, General Hoyt S. Vandenberg, Vice Chief of Staff of the newly created U.S. Air Force, signed a "Statement of Policy for a Satellite Vehicle." This statement declared that the Air Force "as the Service dealing primarily with air weapons—especially strategic—has logical responsibility for the Satellite." The document also stated that the technology was immature and that a development decision lay some time in the future.

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4. R. Cargill Hall, "Early U.S. Satellite Proposals," *Technology and Culture* 4 (Fall 1963): 410-34. See also R. Cargill Hall, "Earth Satellites: A First Look by the United States Navy," in R. Cargill Hall, ed., *History of Rocketry and Astronautics: Proceedings of the Third through the Sixth History Symposia of the International Academy of Astronautics* (San Diego, CA: Univelt, Inc., 1986), AAS History Series, Vol. 7, Part II, pp. 253-78.

5. Document II-2 in Logsdon, gen. ed., *Exploring the Unknown*, 1: 236-45.

6. Merton E. Davies and William R. Harris, *RAND's Role in the Evolution of Balloon and Satellite Observation Systems and Related U.S. Space Technology* (Santa Monica, CA: The RAND Corporation, 1988), p. 15.

Until that time, the issue would be studied "with a view to keeping an optimum design abreast of the art, to determine the military worth of the vehicle—considering its utility and probable cost—to insure [sic] development in critical components, if indicated, and to recommend initiation of the development phases of the project at the proper time." [II-1]

With a very clearly stated position on the matter, the Air Force asked RAND in February 1948 to conduct further studies on the satellite. RAND contracted with several other organizations, including North American Aviation, the Radio Corporation of America (RCA), the Ohio University Research Foundation, and Boston University. This was a classic early Cold War research effort, uniting government, industry, and academia. By 1950, RAND's research was bearing fruit; in November, the Air Force Directorate of Intelligence recommended that further research and development was justified.[7]

The primary use envisioned for a satellite was reconnaissance. In February 1951, Colonel Bernard A. Schriever organized a conference during which he established several criteria for a satellite reconnaissance system. Early the next month, tests were conducted using television cameras to establish further baselines for these criteria. In April 1951, RAND released two further reports. The first, *Feasibility of Weather Reconnaissance from a Satellite Vehicle,* examined the requirements and value of weather forecasting from space. In particular, such a system enabled weather reconnaissance behind enemy lines, something crucial to strategic bombing campaigns. The second study was *Utility of a Satellite Vehicle for Reconnaissance.*[8]

This study led to yet another study, which eventually became known as Project Feed Back; it was presented to the Air Force in 1954. The report demonstrated that a space reconnaissance satellite was feasible, and it outlined the steps to develop it. In December 1948, the "first report" of the Secretary of Defense stated:

> *The Earth Satellite Vehicle Program, which was being carried out independently by each military service, was assigned to the Committee on Guided Missiles for coordination. To provide an integrated program with resultant elimination of duplication, the committee recommended that current efforts in this field be limited to studies and component designs; well-defined areas of such research have been allocated to each of the three military departments.*[9]

This statement seems to have been an anomaly, because the three services continued their individual studies on their own. Why it was written remains unknown. The Air Force's clearly stated claim on the satellite mission may have prompted it. But after the publication of the report, nothing changed—there was no centralization of the satellite mission, and the services continued their separate low-level studies. The report apparently was completely overlooked.

In the meantime, others in the civilian world had been working on different satellite ideas. During a spring 1950 meeting at scientist James A. Van Allen's home, the prospect of an International Geophysical Year (IGY) was discussed. S. Fred Singer, a physicist at the University of Maryland, proposed building a satellite for the IGY. Singer later proposed a Minimum Orbital Unmanned Satellite of the Earth (MOUSE) at the fourth Congress of the International Astronautical Federation in Zurich, Switzerland, in 1953.[10] Singer's

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7. *Ibid.*, pp. 17-19.
8. *Ibid.*, pp. 23-30.
9. Office of the Secretary of Defense, *First Report of the Department of Defense* (Washington, DC: Office of the Secretary of Defense, December 1948), p. 129.
10. Document II-11 in Logsdon, gen. ed., *Exploring the Unknown,* 1: 314-24.

paper was based on a study prepared two years earlier by members of the British Interplanetary Society.

On June 23, 1954, Frederick C. Durant III, former president of the American Rocket Society and then president of the International Astronautical Federation, called Wernher von Braun at the Redstone Arsenal and invited him to a meeting two days later in Washington, D.C., at the Office of Naval Research, which had been involved in the earlier V-2 upper atmosphere experiments. At this meeting, plans were discussed for developing a satellite program using already existing rocket components. Further meetings followed at which the Army gave tentative approval, provided that the cost was not too great and the plan did not interfere with missile development. Von Braun's secret report, *A Minimum Satellite Vehicle: Based on Components available from missile developments of the Army Ordnance Corps*, was submitted to the Army.[11] It summarized what he had said at earlier meetings. The Air Force's declaration six years before that it was responsible for satellite development was either unknown or ignored by the Army.[12]

Sometime in 1952, President Truman discussed the satellite issue with his personal physician, Brigadier General Wallace Graham. Graham persuaded Truman to commission a study from Aristid Grosse, a chemical engineer who had worked on some military projects. Grosse conducted extensive discussions with Wernher von Braun. He delivered his rather slim report not to Truman, but to the Eisenhower administration.[13] Despite years of research on the subject, the space issue never reached the upper levels of the Truman White House.[14] There was no Truman space policy, and space issues remained largely the realm of a small group of engineers and analysts.

However, to say that the Grosse report had no effect is to overlook one key fact: although not delivered to the administration for which it was intended, it was delivered to the new Assistant Secretary of Defense for Research and Development, Donald A. Quarles. In the Eisenhower administration, Quarles was to play a major role in establishing the American space program.

The Killian Report

In September 1954, the Science Advisory Committee of the Office of Defense Mobilization, under orders from President Eisenhower, began a study of the problem of surprise attack.[15] One of the major reasons behind this study was the surprises the Soviet Union had achieved in regard to atomic weapon development. The main task of the committee was "obtaining before it is launched more adequate foreknowledge of a surprise attack, should one be planned, obtaining better knowledge of enemy capabilities."

This special group was headed by Massachusetts Institute of Technology (MIT) President James R. Killian, who later became Eisenhower's science advisor. The group became known as the Technological Capabilities Panel, and it issued its report, titled "Meeting the Threat of Surprise Attack," on February 14, 1955. Eisenhower and others often referred to this document as the "Killian Report."

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11. Document II-7 in *ibid.*, 1: 274-81.
12. The earlier Air Force declaration was also apparently more of an internal document intended to authorize further Air Force studies of the issue rather than an external statement of policy; *ibid.*
13. Document II-5 in *ibid.*, 1: 266-69.
14. Rip Bulkeley, *The Sputniks Crisis and Early United States Space Policy* (Bloomington: Indiana University Press, 1991), p. 83.
15. J.R. Killian, Jr., to General Curtis E. LeMay, September 2, 1954, Papers of Curtis LeMay, Box 205, Folder B-39356, Manuscript Division, Library of Congress, Washington, DC.

During the course of deliberations, the intelligence panel, headed by Polaroid's Din Land, became aware of two advanced proposals for intelligence collection. One was the nuclear-powered reconnaissance satellite using a television camera outlined in the Project Feed Back study. The other idea was for a high-flying strategic reconnaissance aircraft then under consideration by the Air Force. While investigating the latter, Land's panel became aware of a proposal by the Lockheed Skunk Works for its own high-flying strategic reconnaissance aircraft known as the CL-282. They brought this to the attention of President Eisenhower. Unlike the Air Force program, the CL-282 would be configured for strategic reconnaissance prior to hostilities—what was referred to as "pre–D-Day reconnaissance." This was a mission that the Strategic Air Command had previously rejected.

Eisenhower approved the CL-282 in the fall of 1954, and he placed it under the charge of the CIA. It eventually became known as the U-2, and Richard Bissell, a newcomer to the CIA was to manage the program. When the report was issued in the spring of 1955, it apparently never mentioned the aircraft, which was, however, detailed in a classified annex to the report. This was most likely for the "eyes only" of President Eisenhower, and he probably destroyed it along with another classified annex on submarine-launched ballistic missiles.[16]

It was obvious to those involved in the issue that overflight of another nation's territory by such an aircraft would constitute a clear violation of international law and could also be viewed as a hostile act. In fact, such issues were not abstract, because American aircraft flying on the periphery of the Soviet Union were being fired on and even occasionally shot down.

However, the other advanced reconnaissance proposal—a satellite—would fly much higher and would not necessarily violate international law because no clear definition existed of where "airspace" ended and "space" began. Realizing this, Land and the others on his panel decided to attempt to strongly influence the evolution of international law. They proposed that the United States first launch a scientific satellite to establish "Freedom of Space." By doing so, later military and intelligence satellites would be able to overfly Soviet territory following the precedent established by the earlier civilian satellite. The report's recommendation 9.b read:

Freedom of Space. The present possibility of launching a small artificial satellite into an orbit about the earth presents an early opportunity to establish a precedent for distinguishing between "national air" and "international space," a distinction which could be to our advantage at some future date when we might employ larger satellites for intelligence purposes. [II-2]

Land and others considered the reconnaissance satellite to be technologically unrealistic in the near future, but that should not prevent the United States from helping to establish the right to overfly other nations in space. This was best done with a satellite that was nonmilitary in nature.

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16. Although the intelligence section of the Technological Capabilities Panel report remains classified, awaiting review as of mid-1996, the index has been declassified. It includes the word "satellites," but apparently in the context of satellite countries of the Soviet Union. Those who have seen the report confirm that it mentioned balloon and satellite programs, but it apparently did not mention the U-2 aircraft, except in a separate appendix that Eisenhower most likely destroyed. The information about the separate "eyes only" reports given to Eisenhower is contained in an interview with Killian. Other documents concerning the recommendations of the intelligence committee have also been released. "The Report to the President by the Technological Capabilities Panel of the Science Advisory Committee," February 14, 1955, Office of the Staff Secretary: Records of Paul T. Carroll, Andrew J. Goodpaster, L. Arthur Minnich, and Christopher H. Russell, 1952-61, Subject Series, Alphabetical Subseries, Box 16, "Killian Report—Technological Capabilities Panel (2)," Dwight D. Eisenhower Library, Abilene, Kansas.

The Scientific Satellite Program

In August and September of 1954, Wernher von Braun and his colleagues at the Army Ballistic Missile Agency (ABMA) in Huntsville, Alabama, teamed up with the Office of Naval Research to propose a satellite called *Orbiter.* This was essentially a slight re-work of von Braun's Minimum Unmanned Satellite Vehicle. *Orbiter* was to be a scientific satellite only, essentially mirroring the earlier upper atmosphere research conducted with the V-2 rockets at White Sands. Later in the year, the American Rocket Society prepared a detailed survey of possible scientific and other uses of a satellite and proposed it to the U.S. National Committee for the IGY, a group under the National Academy of Sciences (NAS).[17]

As it was, 1954 proved to be a very important year for the generation of significant ideas concerning scientific and intelligence collection systems. In addition to both the Project Feed Back and the Lockheed CL-282 ideas, the NAS was now considering a scientific satellite as well. These projects were inextricably linked politically.

While the Project Feed Back study and the Killian Report were both highly secret, *Orbiter* was not. The CL-282, in particular, was known to only a handful of people. One person who did know of all three projects, as well as the Technological Capabilities Panel report, was the Assistant Secretary of Defense for Research and Development, Donald Quarles. He was in charge of virtually all defense research projects.

On the same day as the release of the Technological Capabilities Panel report, the U.S. National Committee for the IGY presented a recommendation to National Science Foundation Director Alan T. Waterman at the NAS. The committee recommended that a scientific satellite be launched as part of the IGY.[18] Quarles lobbied Waterman to suggest this idea to the National Security Council (NSC), and four days later, Waterman sent a letter to Deputy Under Secretary of State Robert Murphy, proposing that the United States conduct such a scientific mission.[19]

Four days later, Murphy met with Waterman, NAS President Detlev Bronk, and Lloyd Berkner (who at the time was a member of the U.S. National Committee for the IGY) to discuss the issue. In a letter one month later, Murphy stated that such a proposal would "as a matter of fact, undoubtedly add to the scientific prestige of the United States, and it would have a considerable propaganda value in the cold war."[20] Having gained the concurrence of the Department of State, Waterman then discussed the issue once again with Quarles, who suggested that he consult CIA Director Allen Dulles on how to proceed. Waterman did so and gained Dulles's support for the program. He also spoke with Bureau of the Budget Director Percival Brundage to gain his cooperation when needed. Thus, the proposal now had the support of the Departments of State and Defense, the CIA, and the Bureau of the Budget. Waterman also agreed to formally propose the full program to an executive session of the National Science Board on May 20, and he notified Quarles of these events on May 13, 1955.[21]

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17. Constance McLaughlin Green and Milton Lomask, *Vanguard: A History* (Washington, DC: Smithsonian Institution Press, 1971), pp. 22-23.

18. Joseph Kaplan, Chairman, United States National Committee, International Geophysical Year 1957-58, National Academy of Sciences, to Dr. A.T. Waterman, Director, National Science Foundation, March 14, 1955, Space Policy Institute Documentary History Collection, Washington, DC.

19. Alan T. Waterman, Director, Memorandum for Mr. Robert Murphy, Deputy Under Secretary of State, 18 March, 1955, Space Policy Institute Documentary History Collection.

20. Robert Murphy, "Memorandum for Dr. Alan T. Waterman, Director, National Science Foundation," April 27, 1955, Space Policy Institute Documentary History Collection.

21. Alan T. Waterman, Director, to Donald A. Quarles, Assistant Secretary of Defense (Research and Development), May 13, 1955, Space Policy Institute Documentary History Collection.

On May 20, 1955, the NSC approved a top-level policy document known as NSC 5520, "Draft Statement of Policy on U.S. Scientific Satellite Program," which stated that the United States should develop a small scientific satellite weighing 5 to 10 pounds.[22] Paragraph number 2 of the document stated (the newly released part is in roman type):

The report of the Technological Capabilities Panel of the President's Science Advisory Committee recommended that intelligence applications warrant *an immediate program leading to a very small satellite in orbit around the earth, and that re-examination should be made of the principles or practices of international law with regard to "Freedom of Space" from the standpoint of recent advances in weapon technology.*

The other major declassified portion of the document (paragraph number 5) stated:

From a military standpoint, the Joint Chiefs of Staff have stated their belief that intelligence applications strongly warrant the construction of a large surveillance satellite. While a small scientific satellite cannot carry surveillance equipment and therefore will have no direct intelligence potential, it does represent a technological step toward the achievement of the large surveillance satellite, and will be helpful to this end so long as the small scientific satellite program does not impede development of the large surveillance satellite.

NSC 5520 also stated (starting at the end of paragraph number 6):

Furthermore, a small scientific satellite will provide a test of the principle of "Freedom of Space." The implications of this principle are being studied within the Executive Branch. However, preliminary studies indicate that there is no obstacle under international law to the launching of such a satellite.

7. It should be emphasized that a satellite would constitute no active military offensive threat to any country over which it might pass. Although a large satellite might conceivably serve to launch a guided missile at a ground target, it will always be a poor choice for the purpose. A bomb could not be dropped from a satellite on a target below, because anything dropped from a satellite would simply continue alongside in the orbit.[23]

Although the document correctly noted the limited utility of satellites as active military offensive threats, this was not the purpose of the program. Also included in NSC 5520 was the clear stipulation that the program was not to interfere in any way with the ballistic missile programs.

Establishing a right of overflight was important, but developing the intercontinental ballistic missile (ICBM) and the intermediate range ballistic missile (IRBM) was considered even more important. Both considerations later established a framework for conducting the program—the U.S. scientific satellite, although developed by the U.S. military, would be handled in such a way as to both seem as disassociated from ballistic missiles as possible and interfere in their development as little as possible.

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22. Document II-10 in Logsdon, gen. ed., *Exploring the Unknown*, 1: 308-14.

23. NSC 5520, May 20, 1955, Record Group 59, General Records of the Department of State: Records Relating to State Department Participation in the Operations Coordinating Board and the National Security Council, 1947-1963, Box 112, "NSC 5520," National Archives and Records Administration,Washington, DC.

Quarles oversaw the selection process that followed. It involved the creation of the Committee on Special Capabilities, headed by Homer Stewart. This committee evaluated the various proposals and rejected the Army's Jupiter rocket for reasons that included its obvious military ties.[24]

It was determined that the scientific satellite program should look as nonmilitary as possible—a rocket vehicle that was not the direct development of a ballistic missile was considered the best way to do this. The result was the selection of the Navy's Vanguard rocket, which had its genesis in a pure research program and would be developed virtually from the ground up as a space vehicle.[25]

At the time, there was no clear distinction made between military and civilian space exploration. The military was to bear responsibility for launching all U.S. payloads. The payloads could be either civilian, such as the NAS satellite, or military, such as the Project Feed Back satellite, but all would fly on military rockets. Meanwhile, a distinction was made among different degrees of what can only be labeled "militaristic" involvement. The Vanguard rocket, although developed by the Navy, had no direct connections to a weapons system. It was therefore a better choice politically to peacefully establish the right to overfly foreign territory. Fundamental to Eisenhower's philosophy at this time was not to inflame the superpower rivalry unnecessarily. Keeping the rocket program as far away from weapons development was an outgrowth of this attitude.

Lukewarm Military Enthusiasm for Space

The Air Force had made only a half-hearted effort at submitting a proposal for the scientific satellite program. At the time, the program was apparently too uninteresting to garner top-level Air Force support. General Bernard A. Schriever, commander of the Western Development Division and head of U.S. ICBM development, thought that the Air Force should concentrate on the military satellite instead. On March 16, 1955, the Air Force issued General Operational Requirement No. 80. Up until this time, the approval for

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24. Charles A. Lindbergh wrote in the foreword to the most detailed book on the Vanguard program (Green and Lomask, *Vanguard: A History*), which was written before the recent revelations on the origins of the program, stated on page vi:

Why was the Redstone-von Braun satellite project not supported? Answers vary with the person talked to: The Navy's brilliant developments in satellite instrumentation had tipped the choice to Vanguard, and budgetary restrictions had prevented a paralleling project. The name Redstone was too closely associated with military missiles. Vanguard offered lower costs, more growth potential, longer duration of orbiting. We would eventually gain more scientific information through Vanguard than through Redstone. To these observations, I can add from my own experience that inter-service rivalry exerted strong influence; also, that any conclusion drawn would be incomplete without taking into account the antagonism still existing toward von Braun and his co-workers because of their service on the German side of World War II.

25. Eisenhower's staff secretary, then-Colonel Andrew Goodpaster, provided some insight into the Huntsville Germans' views and their lobbying on behalf of their work in a memorandum written in the summer of 1956:

On May 28th Secretary [Deputy Secretary of State] Hoover called me over to mention a report he had received from a former associate in the engineering and development field regarding the earth satellite project. The best estimate is that the present project would not be ready until the end of '57 at the earliest, and probably well into '58. Redstone had a project well advanced when the new one was set up. At minimal expense ($2-$5 million) they could have a satellite ready for firing by the end of 1956 or January 1957. The Redstone project is one essentially of German scientists and it is American envy of them that has led to a duplicative project.

I spoke to the President about this to see what would be the best way to act on the matter. He asked me to talk to Secretary Wilson. In the latter's absence, I talked to Secretary Robertson today and he said he would go into the matter fully and carefully to try to ascertain the facts. In order to establish the substance of this report, I told him it came through Mr. Hoover (Mr. Hoover had said I might do so if I felt it necessary).

Quoted in Colonel A.J. Goodpaster, "Memorandum for Record," June 7, 1956, White House Office, Office of the Staff Secretary: Records, 1952-1961, Box 6, "Missiles and Satellites," Eisenhower Library.

further satellite studies had been from a low level of the Air Force bureaucracy; now the go-ahead came from the top. On April 2, 1956, Schriever and General Thomas Power, the commander of the Air Research and Development Command, approved a full-scale development plan for what was called "Weapons System 117L" (WS-117L), a reconnaissance satellite program. It would utilize an Atlas launch vehicle and was to be fully operational by 1963. Air Force headquarters approved the plan on July 24, 1956, and allocated $3 million. This proved to be a major disappointment to all involved, because it was less than 10 percent as much as was needed to go to full-scale development.[26]

The Air Force, as a young organization that owed its very existence to modern technology, was also the most logical of the services to embrace new technology such as satellites and long-range rockets. But at the same time, the Air Force was also dominated by the culture of the manned strategic bomber, and any new missions often had to serve this culture. Thus, the concept of strategic rocketry was not one that was adopted readily or without resistance by the Air Force.[27]

The Air Force's strategic bombing emphasis had been one of the main reasons that the Western Development Division had been set up on the west coast instead of the preexisting development operation at Wright Field in Dayton, Ohio. The satellite program was also more likely to receive the support it needed there than at Wright Field. But Donald Quarles, who had been promoted to Secretary of the Air Force in July 1955, apparently felt that reconnaissance satellites, although a very promising idea, were still a long way from being practical, and he did not provide the money for full-scale development.

In 1956, the Air Force also directed Bell Aircraft Company to conduct a study of a manned boost-glide reconnaissance system known as "Brass Bell." An earlier study, known as BOMI, evolved into a concept known as ROBO, for "rocket bomber." The Air Research and Development Command also issued a system requirement for a hypersonic research and development vehicle known as "Hywards." But the Air Force did not allocate any money to manned space operations in fiscal year 1957.[28]

Similarly, the early RAND studies about the possibilities of space did not receive an enthusiastic response from top leaders of the Air Force. Space was still an expensive and dubious proposition for the Air Force, which was more interested in spending its money on strategic bombers and, to a much lesser extent, the Atlas ICBM. As long as neither the Navy nor the Army was developing a military satellite system, the Air Force did not show much enthusiasm for the various military satellite systems—human and robotic—that it was evaluating. The WS-117L proceeded, and the Air Force even selected Lockheed as the prime contractor for the vehicle. One of the losers in the competition, RCA, then looked elsewhere for an agency to pay it to build a television-equipped satellite. It found the receptive ear of Wernher von Braun. In April 1957, the Army produced the Janus report, which was essentially the RCA bid for the WS-117L.[29]

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26. Davies and Harris, *RAND's Role*, pp. 73-74.

27. See, for instance, Carl Builder, *The Icarus Syndrome* (New Brunswick, NJ: Transaction Books, 1994). To be fair, the manned strategic bomber was a proven technology, whereas ICBMs were not. Furthermore, manned bombers were more flexible, reliable, and accurate than ICBMs would be for a long time. They also were recallable, compared to the "push button" ICBM. As one Air Force historian has noted: "The Air Force's institutional penchant for equating the necessity for a manned bomber to fulfill its primary mission of strategic bombardment, and ensure its continued independence, hindered the incorporation of missile technology. The majority of Air Force leaders believed ballistic missiles should undergo a step by step development, followed by integration into the weapons inventory." Roy F. Houchin, "The Dyna-Soar Program: Why the Air Force Proposed the Dyna-Soar X-20 Program," *Quest: The History of Spaceflight Magazine* 3 (Winter 1994): 10.

28. *Ibid.*

29. "Briefing on Army Satellite Program," November 19, 1957, White House Office, Office of the Special Assistant for Science and Technology, Records (James R. Killian and George B. Kistiakowsky, 1957-61), Box 15, "Space (2)," Eisenhower Library.

Thus, various space programs within the military services received support, but primarily only for continued study, not for substantial development. These programs also produced core groups of enthusiasts. Schriever and his people at the Western Development Division in California were the Air Force space enthusiasts. Von Braun and his ABMA team in Huntsville were the Army space enthusiasts. But in the case of the Air Force, the program lacked support from both the top-level career military officers in the Air Staff and the civilian leadership. Schriever had mentioned satellites in a speech in February 1957. The Office of the Secretary of Defense told him not to mention "space" again—this was not a military priority for the administration, and Eisenhower did not want anyone to think it was, particularly when the White House was concerned about peacefully establishing "Freedom of Space."[30] In the case of the Army, the ABMA was specifically forbidden by the White House to develop satellites. The only satellite program that had all the money it needed was the Navy's Vanguard program, and it quickly ran way over its early estimated budget.

Even though von Braun and the Army were officially precluded from developing a satellite, he and his rocket team lacked faith in the Vanguard Project. In the spring of 1956, they lobbied for a reconsideration to allow the Army to attempt to launch a satellite atop a Jupiter-C missile. This proposal was rejected in the summer of 1956.[31]

In late 1956, after the Vanguard Project was well under way and running into cost overruns, one of von Braun's closest associates, Ernst Stuhlinger, made contact with James Van Allen, who in 1950 had shown an interest in a scientific satellite. Stuhlinger informed Van Allen that, although von Braun had been ordered not to place a satellite in orbit with the Jupiter-C, the team had grave doubts about the officially sanctioned Vanguard Project. Stuhlinger discussed possible scientific payloads capable of being carried atop a Jupiter-C. On November 23, 1956, he sent a letter to Van Allen thanking him for the meeting and proposing that Van Allen visit the ABMA to view their operations. Van Allen apparently did.[32]

Van Allen responded on February 13, 1957, with a list of possible scientific payloads. This letter was sent to William Pickering, Director of the Army's Jet Propulsion Laboratory (JPL) of the California Institute of Technology (the renamed GALCIT operation).[33] It was JPL that had begun to build the Explorer I satellite—work that was both clandestine and forbidden at the time. Also, at some point during this period, von Braun's team entertained RCA, reviewing its failed bid for the WS-117L program.

Meanwhile, establishing "Freedom of Space" continued to be an active concern in policy planning circles in Washington; the legal ramifications were being worked out in the State Department and elsewhere. [II-3] Furthermore, Vanguard ran severely over budget. The initial estimate had been $15 to 20 million for the program. By late 1957, the cost was estimated at ten times that amount. Money had to be found in various budgets to pay for it. Budget Director Percival Brundage said: "Apparently, both the Department of Defense and the National Science Foundation are very reluctant to continue to finance

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30. Neufeld, *The Rocket and the Reich*, p. 181.

31. Dwayne A. Day, "New Revelations About the American Satellite Programme Before Sputnik," *Spaceflight*, November 1994, pp. 372-73.

32. Ernst Stuhlinger, Director, Research Projects Office, Development Operations Division, Army Ballistic Missile Agency, U.S. Army Ordnance Corps, to Dr. Van Allen, Department of Physics, Iowa State University, November 23, 1956, James A. Van Allen Papers, Special Collections, University of Iowa Library, Iowa City.

33. J.A. Van Allen, Head, Department of Physics, State University of Iowa, to Dr. Ernst Stuhlinger, Army Ballistic Missile Agency, February 13, 1957, James A. Van Allen Papers.

this project to completion. But each is quite prepared to have the other do so." The two had supplied some supplementary funds to the program, and, surprisingly, even the CIA contributed $2.5 million in funds. [II-4]

Why this was done is unknown. CIA Director Richard Bissell was kept abreast of the developments and may have realized the importance of "Freedom of Space" to future reconnaissance efforts. It is also true that he had a substantial discretionary fund to spend on unforeseen problems. This fund contained around $100 million and was often used to address pressing national security needs. Completing the Vanguard mission of shaping international law was considered a national security issue, and this may have been why CIA money funded part of the U.S. satellite for the IGY. What it certainly does illustrate, however, is the confluence of both civilian and national security interests in the early space program.

By the end of September 1957, the framework of the American space program was pretty much in place. The military was responsible for launching and supporting all satellites. Scientific satellites would be developed and manufactured by civilian scientists, most likely under the auspices of the NAS or at universities. The Army was not officially involved in any space programs. It was, however, actively studying large rocket proposals and also conducting numerous studies of possible satellite payloads.

The Air Force had the WS-117L under way but was underfunding it. In the summer of 1957, a proposal for a faster, interim reconnaissance satellite using film-return techniques was not received enthusiastically by the Air Force. The Air Force was also undertaking the ROBO, Hywards, and Brass Bell studies, but not at a significant level. Overall, the service's commitment to military space programs was weak—both in the Air Staff and in the civilian Office of the Secretary of the Air Force. At the same time, although military space programs had not received much high-level support in either the Air Force or the Army, within each service core groups of officers and scientists had formed—space enthusiasts who constantly advocated for bigger programs.

Under the restrictions of both NSC 5520 and President Eisenhower's conservative spending priorities, space seemed unlikely to become a major enterprise. Even after the scientific satellite had flown and established "Freedom of Space," it was unlikely that things would change substantially for either the Air Force or the Army. Both would have to face the continued fiscal conservatism of the president and the civilian and military leadership at the Pentagon. Sputnik changed all of that.

Turbulent Transition

On October 4, 1957, the Soviet Union launched Sputnik. The launch itself was not a great surprise to U.S. intelligence, which had ample warning that the Soviets were capable of launching a satellite.[34] The public reaction to the launch was greater than the administration expected, despite plenty of warning in various top-level policy documents.[35]

Eisenhower had failed to realize the degree to which a Soviet first in space could undercut his domestic priorities. He attempted to downplay the significance of Sputnik so

34. Document II-13 in Logsdon, gen. ed., *Exploring the Unknown*, 1: 329.

35. Document II-5 in *ibid.*, 1: 266-69. General Andrew Goodpaster, Eisenhower's staff secretary, stated that Eisenhower had been warned plenty of times of the propaganda effects of such a satellite launch but had always dismissed them. He also stated that the attitude in the White House was generally dismissive of the Sputnik launch for about 24 hours, before the public and scientific reaction of the country became known. After that, everybody's attitude changed. Interview with General Andrew Goodpaster, March 19, 1996, Washington, DC.

that he could "head off a stampede on the Treasury."[36] But if the public reaction was bad enough after Sputnik, it would soon get much worse. On November 3, the Soviets orbited Sputnik II, which weighed 1,121 pounds and carried the dog Laika. The sophistication and size of this satellite (partly because the upper stage remained attached to the payload) left no doubt in the minds of many that the Soviet Union possessed tremendous superiority in space launchers. The public uproar, and Khrushchev's gloating, took on even bigger dimensions when the Vanguard TV-3 launch—billed as a fully operational vehicle and broadcast on national television at the White House's urgings (and the muted protests of the engineers)—blew up on the launch pad on December 6.

The reaction to Sputnik within the military services was swift and startling—and alarmed even Eisenhower. On October 10, the Air Force rolled its three human spaceflight proposals into one and labeled it "Dyna-Soar," for "dynamic soaring." In mid-October, someone leaked information to *Aviation Week* magazine about the WS-117L—including the involvement of Lockheed.[37] On October 26, the Army made a presentation to the Committee on Special Capabilities (which had rejected the Army's earlier scientific satellite proposal), recommending the development of its Janus reconnaissance satellite that would use a television system to photograph the Soviet Union. On December 10, the Air Force created in the Office of the Deputy Chief of Staff/Development a new department called the Directorate of Astronautics.

This enthusiastic response, particularly within the Air Force, came from the career military officers and not the civilian leadership, who shared Eisenhower's skepticism. After objections from Deputy Secretary of Defense Quarles and others, the order establishing the Directorate of Astronautics in the Air Force was revoked only three days after it was issued.[38]

Eisenhower clearly liked none of this. Soon after Sputnik, he admonished his officials not to comment on the issue of whether the United States could have "beaten" the Soviets into space. The reason was that talk about whether or not the Army could have launched a satellite sooner tended to make the matter look like a race, which was exactly what he wanted to avoid.[39]

By sheer coincidence, soon-to-be Secretary of Defense Neil McElroy was having dinner with ABMA Director General John Medaris and Wernher von Braun when the announcement of the Sputnik launch was made. Von Braun immediately pressured McElroy to let the ABMA team launch a satellite into orbit; they received permission on November 8. The ABMA's military leaders apparently had their own satellite in mind for the mission. But von Braun and JPL's leadership had their own, and this was initially named "Deal-1." As in a game of poker, if you are dealt a bad hand—as the country had been dealt with both Sputniks I and II—you fold and tell the person to deal you another. JPL Director William Pickering was able to convince ABMA Director Medaris that their satellite was the better choice.[40] Deal-1 was soon renamed Explorer I, and it was launched into orbit on January 31, 1958.

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36. Walter A. McDougall, . . . *The Heavens and the Earth: A Political History of the Space Age* (New York: Basic Books, 1985), p. 146.

37. "USAF Pushes Pied Piper Space Vehicle," *Aviation Week*, October 14, 1957, p. 26.

38. Lee Bowen, *The Threshold of Space: The Air Force in the National Space Program, 1945-1959*, USAF Historical Division Liaison Office, September 1960, p. 20.

39. Brigadier General A.J. Goodpaster, Memorandum of Conference with the President, Office of the Staff Secretary: Records of Carroll, Goodpaster, Minnich, and Russell, 1952-61, Subject Series, Department of Defense Subseries, Box 6, "Missiles and Satellites, Vol. I (3) [September-December 1957]," Eisenhower Library.

40. William E. Burrows, *Exploring Space* (New York: Random House, 1990), p. 76. The information on the story of the name Deal-1 comes from Dr. Jonathan McDowell at the Harvard-Smithsonian Center for Astrophysics.

The New Military Space Agency

In November, newly appointed Secretary of Defense McElroy proposed centralizing control of the various American space projects then under way, such as Vanguard and the WS-117L, along with advanced ballistic missile development. They would be placed into a Defense Special Projects Agency, which would be responsible for whatever projects the secretary would assign to it. The idea for this agency apparently arose from the President's Science Advisory Council in mid-October, just days after both Sputnik and McElroy's nomination.[41] Eisenhower himself expressed the opinion that a fourth service should be established to handle the "missiles activity."[42] McElroy said that he was thinking about a "Manhattan Project" for anti-ballistic missiles. The president thought that a separate organization might be a good idea for this problem.[43] In testimony before Congress, Quarles, who might easily have been regarded as an Air Force partisan, stated that long-range, surface-to-surface missiles had been assigned to the Air Force because it possessed the targeting and reconnaissance capabilities to use them, not because it was uniquely an Air Force mission.[44] Space could conceivably be treated in the same way.

Killian and the Science Advisory Committee of the Office of Defense Mobilization found McElroy more receptive than his predecessor.[45] On November 7, in a national television address, Eisenhower announced that he was elevating Killian to the position of Special Assistant for Science and Technology and head of the President's Science Advisory Committee. The press quickly labeled Killian the "Missile Czar." By this time, Killian was probably pushing the idea of a separate agency for space as well.[46]

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41. Goodpaster interview, March 19, 1996.

42. Eisenhower's comments on this subject appear in numerous documents. For instance, in October 1957, Goodpaster reported: "The President went on to say he sometimes wondered whether there should not be a fourth service established to handle the whole missiles activity." Brigadier General A.J. Goodpaster, "Memorandum of Conference with the President, October 11, 1957, 8:30 AM," October 11, 1957, Ann Whitman File, DDE Diary Series, Box 67, "Oct. 57 Staff Notes (2)," Eisenhower Library. In January 1958, Goodpaster reported: "In the course of the discussion the President indicated strongly that he thinks future missiles should be brought into a central organization." Brigadier General A.J. Goodpaster, "Memorandum of Conference with the President, January 21, 1958," January 22, 1958, Office of the Staff Secretary: Records of Carroll, Goodpaster, Minnich, and Russell, 1952-61, Subject Series, Department of Defense Subseries, Box 6, "Missiles and Satellites, Vol. II (1) [January-February 1958]," Eisenhower Library. In February 1958, Goodpaster reported: "The President said that he has come to regret deeply that the missile program was not set up in [the Office of the Secretary of Defense] rather than in any of the services." Brigadier General A.J. Goodpaster, "Memorandum of Conference with the President, February 4, 1958 (following Legislative Leaders meeting)," February 6, 1958, Office of the Staff Secretary: Records of Carroll, Goodpaster, Minnich, and Russell, 1952-61, Subject Series, Department of Defense Subseries, Box 6, "Missiles and Satellites, Vol. II (1) [January-February 1958]," Eisenhower Library.

43. Brigadier General A.J. Goodpaster, "Memorandum of Conference with the President, October 11, 1957," Ann Whitman File, DDE Diary Series, Box 67, "Oct. 57 Staff Notes (2)," Eisenhower Library. In February, another memorandum states: "The President said that he has come to regret deeply that the missile program was not set up in [the Office of the Secretary of Defense] rather than in any of the services. Personal feelings are now so intense that changes are extremely difficult." Brigadier General A.J. Goodpaster, "Memorandum of Conference with the President, February 4, 1958 (Following Legislative Leaders meeting)," February 6, 1958, Office of the Staff Secretary: Records of Carroll, Goodpaster, Minnich, and Russell, 1952-61, Subject Series, Department of Defense Subseries, Box 8, "Missiles and Satellites, A National Integrated Missile and Space Vehicle Development Program, December 10, 1957," Eisenhower Library.

44. Robert Frank Futrell, *Ideas, Concepts, Doctrine, Vol. 1: A History of Basic Thinking in the United States Air Force* (Maxwell AFB, AL: Air University Press, 1989) p. 589. The comments on Quarles's partisanship come from the Goodpaster interview, March 19, 1996.

45. Richard Vernon Damms, "Scientists and Statesmen: President Eisenhower's Science Advisors and National Security Policy, 1953-1961," Ph.D. Diss., Ohio State University, 1993, p. 297.

46. Goodpaster interview, March 19, 1996.

The Defense Special Projects Agency would act as a central authority for all U.S. space programs and would essentially contract out missions to the separate services, civilian government agencies, and even universities and private industry. "Above the level of the three military services," McElroy said, "having its own budget, it would be able to concentrate on the new and the unknown without involvement in immediate requirements and inter service rivalries." McElroy also stated in front of Congress that "the vast weapons systems of the future in our judgment need to be the responsibility of a separate part of the Defense Department."[47] This proposal was placed in a DOD reorganization bill. At this point, it was still assumed that the entire American space program would remain under military control, although at the level of the secretary of defense, in an office specially created to manage it.

On December 6, McElroy received a letter from the Joint Chiefs of Staff stating their opposition to the creation of the Defense Special Projects Agency. They felt that line authority for space programs should remain within the services themselves. Schriever also objected. He wanted an authority that would be able to set policy, but not one that would actually manage programs for astronautics. This, he felt, would duplicate capabilities already within his own organization.[48] McElroy—and, more importantly, Eisenhower—did not agree. This was to be a constant source of contention for the next year and a half.

All of these events apparently were having a cumulative effect on Eisenhower, who was concerned that the military services were less focused on their missions and more interested in grabbing this newly opening frontier as their own turf. For Eisenhower, this was a constant worry. He had always been concerned about the parochialism and turf-building impulses of the military and became convinced that he was seeing it again. A separate military space agency seemed to be the way to avoid it.

A Separate Civilian Agency

At the end of December 1957, Killian drafted a "Memorandum on Organizational Alternatives for Space Research and Development." In it, he argued that the Defense Special Projects Agency was a good idea and should house the DOD space program. In addition, much space-related research and development properly belonged in such an agency. At the same time, however, the scientific community was arguing that purely scientific and nonmilitary aspects of space research should not be under the control of the military. There were two options for addressing this. The first option was to establish a central space laboratory within DOD with a broad charter that included basic space research. The second option was to establish a new civilian space agency formed around NACA.

Although Killian did not specifically recommend one option over the other, he concluded:

The overall plan, then, must keep steadily in view the need for those means and programs which will command the interest and participation of our best scientists. We must have far more than a program which appeals to the "space cadets." It must invoke, in the deepest sense, the attention of our best scientific minds if we as a nation are to become a leader in this field. If we do not achieve this, then other nations will continue to hold the leadership.[49]

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47. *Organization and Management of Missile Programs,* Hearings before a Subcommittee of the Committee on Government Operations, U.S. House of Representatives, 86th Cong., 2d sess. (Washington, DC: U.S. Government Printing Office, 1959), p. 133.

48. Futrell, *Ideas, Concepts, Doctrine,* 1: 590.

49. Document IV-1 in Logsdon, gen. ed., *Exploring the Unknown,* 1: 628-31.

In January 1958, the Senate began a series of public hearings on the country's space program. They were ostensibly intended to investigate the status of the U.S. missile and space programs and to determine why the United States was apparently so far behind the Soviet Union in space. But Senate Majority Leader Lyndon Johnson also wanted to use them to publicly embarrass Eisenhower.

Before the hearings began, on January 7, 1958, McElroy requested that all three services list their proposed space projects. The ABMA, under von Braun, had an extensive list, such as reconnaissance, meteorology, basic science, and extensive rocket development for space missions, including the delivery of supplies to paratroopers in enemy territory.[50] The Navy was already responsible for the one satellite program that was actually building hardware and was not itself adverse to expanding its slice of the pie.

The Air Force expected to be lead agency in the new space program. The Air Staff by now had ambitious space plans that included reconnaissance, early warning, and hypersonic space planes. It also had expanded its wish list to include nuclear rockets to service lunar bases and soon added a proposal for placing an American in space sooner than the Dyna-Soar schedule would allow. The uniformed Air Force interpreted this request as an indication that not only was it being named lead agency for space, but that its grandiose program was about to be approved.[51] This propensity of the Air Force for thinking big was well known in the White House, and members of the President's Science Advisory Committee felt they had an obligation to "ridicule the occasional wild-blue-yonder proposals by a few Air Force officers for the exploitation of space for military purposes."[52]

At the same time, the Air Force signed several agreements with NACA concerning the Dyna-Soar program (also known as Weapons System 464L). [II-5, II-6, II-7] The Air Force was interested in the strategic bombardment aspects of the program, while NACA was interested in the possible civil applications of such a vehicle. What differentiated these agreements from earlier space cooperation was that both the military and civilian agencies were to cooperate on the development of a space payload, not simply focus individually on the payload or the launch vehicle. The precedent for this cooperation came from the previous Air Force-NACA work on the X-plane series, particularly the challenging X-15 program.

Discussion of the Defense Special Projects Agency continued within the administration. Its name was changed to the Advanced Research Projects Agency (ARPA), and Eisenhower sent a message to Congress on January 7, 1958, requesting supplemental appropriations for the agency.[53] In early January, the newly created President's Science Advisory Committee addressed the issue of ARPA. Other than opposing the placement of advanced ICBM research into a separate agency instead of keeping it with the current ICBM programs, the committee had no objection to ARPA.

On February 4, 1958, during a White House meeting between Eisenhower and key Senate Republicans to discuss legislation currently before Congress, the issue of space came up again. Eisenhower felt that all of the nation's space programs could be adequately housed within DOD, presumably with ARPA in charge. Eisenhower wanted to

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50. "Proposal: A National Integrated Missile and Space Vehicle Development Program," December 10, 1957, Report No. D-R-37, Office of the Staff Secretary: Records of Carroll, Goodpaster, Minnich, and Russell, 1952-61, Subject Series, Department of Defense Subseries, Box 8, "Missiles and Satellites, A National Integrated Missile and Space Vehicle Development Program, December 10, 1957," Eisenhower Library.

51. Bowen, *The Threshold of Space*, p. 22.

52. James R. Killian, Jr., *Sputnik, Scientists, and Eisenhower: A Memoir of the First Special Assistant to the President for Science and Technology* (Cambridge, MA: MIT Press, 1977), pp. 296-97.

53. *Organization and Management of Missile Programs*, Hearings, U.S. House of Representatives, 86th Cong., 2d sess., p. 133.

avoid duplication of effort, and because military space programs were of paramount importance, he saw no need for creating a civilian space agency outside DOD.[54]

Killian expressed some reservations at having the military run the U.S. space program. The interests of civilian scientists were unlikely to be represented in such an organization, and Killian was, after all, a scientist himself. But it was Vice President Richard Nixon who stated that it was important for the United States to have a civilian space program entirely separate from the military. This, Nixon argued, would advance the American position in the world the most.[55]

On February 7, 1958, James Killian and Din Land, who was also a member of the President's Board of Consultants on Foreign Intelligence Activities, met with Eisenhower and his staff secretary, General Andrew Goodpaster. They briefed him on the potential of both a recoverable space capsule and a supersonic reconnaissance aircraft program, suggesting that to speed up the development of a reconnaissance satellite, the United States should pursue the recoverable capsule idea as an "interim" solution. Eisenhower apparently accepted this recommendation at that time.

An equally important result of this first meeting was the decision to finalize Secretary of Defense McElroy's proposal and create ARPA to house highly technical defense research programs. General Electric executive Roy W. Johnson was to serve as its director. Eisenhower decided to give ARPA control of all military space programs. The military "man-in-space" program, meteorological programs, and the WS-117L would all be turned over to ARPA.

During a second conference on February 8 concerning the recoverable satellite program, Eisenhower said "emphatically that he believed the project should be centered in the new Defense space agency, doing what CIA wanted them to do."[56] This was a major shift in the development of the reconnaissance satellite program; not only did it give it top-level approval, it also removed responsibility for the film-return satellite from the Air Force and granted it to the CIA, mirroring the earlier U-2 decision.

The importance of these meetings in early February cannot be overemphasized. In the course of only a few days, Eisenhower had not only taken the entire military space program, particularly the Air Force's ambitious plans, and given it to a newly created DOD agency, but he had also taken a key project in that program and given it to the CIA. Both decisions later had profound effects on the shape of the American military and civilian space programs. In addition, the president had begun to address the issue of creating a separate civilian space agency. This was being heavily discussed in Congress and the press, but until the February 4 meeting, Eisenhower apparently thought that the issue of duplication of effort justified keeping all space research located in DOD, centralized at a level above any of the rival armed services.

A month later, on the same day that the Air Force proposed the approval of a "man-in-space" program, Eisenhower announced his decision to create a separate civilian space agency, with NACA as its core. This was to forever change the nature of civil-military cooperation in the American space program.

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54. Eisenhower may have also been swayed by public opinion at the time, which was generally in favor of a separate civilian space program. See Robert Hotz, "NACA, The Logical Space Agency," *Aviation Week*, February 3, 1958, p. 21.

55. Document IV-2 in Logsdon, gen. ed., *Exploring the Unknown*, 1: 631-32.

56. "Memorandum of Conferences on 7 and 8 February, 1958," cited in "CORONA Program Profile," Lockheed Press Release, May 1995. This document is apparently the only written record of these meetings and the decision to proceed with CORONA. It is therefore one of the most important documents on the reconnaissance satellite program. Unfortunately, it remains classified in the Eisenhower Library.

Sputnik brought space to the attention of the top military and civilian Air Force leadership. It was suddenly a highly visible and exciting endeavor and one in which top Air Force officers naturally felt that the service should lead. As a result, the dreams of the service's space enthusiasts suddenly received high-level attention. Chief among these was the plan to place a human—an Air Force pilot, no less—in orbit around the Earth.

Sputnik also re-focused attention on Wernher von Braun's rocket team at the ABMA—a highly capable team of engineers who dramatically enhanced their reputation by launching Explorer I. The Army hoped that the ABMA would be the flag-carrier for a significant Army role in space.

However, the ambitious plans of both the Air Force and Army ran headlong into reality—and the civilian leadership of DOD. In February 1958, ARPA was formally created, and the interim reconnaissance satellite program (later called CORONA) was placed under CIA control. ARPA assumed control of the manned ballistic capsule project as well. One by one, the Air Force's other plans were gradually stripped away. The Army's programs did not receive serious support; despite its impressive capabilities, the "ground service" was not considered particularly well-suited to lead the country into space.

Thus, in the immediate post-Sputnik period, the Air Force saw its plans for becoming an "aerospace force" emerge and then quickly vanish—one by one lost to other agencies. In many of the programs that it had conceived and pioneered, it was thus reduced to a support role—almost the same as a contractor. Over the next few months, it became obvious that the projects it did not lose to ARPA would be lost anyway to the new civilian agency.

The one program of which the Air Force did maintain exclusive control was the Dyna-Soar project. This was not simply a consolation prize; it was, in fact, the most important mission to many within the Air Force space community. It had everything that an Air Force space program was expected to have—wings and a human in the cockpit. What it lacked was a clearly defined mission.

The Transition

The National Aeronautics and Space Act of 1958 established a purposely blurry line between NASA and the military space programs. Under the "Declaration of Policy and Purpose," the Space Act states:

The Congress declares that the general welfare and security of the United States require that adequate provision be made for aeronautical and space activities. The Congress further declares that such activities shall be the responsibility of, and shall be directed by, a civilian agency exercising control over aeronautical and space activities sponsored by the United States, except that activities peculiar to or primarily associated with the development of weapons systems, military operations, or the defense of the United States (including the research and development necessary to make effective provision for the defense of the United States) shall be the responsibility of, and shall be directed by, the Department of Defense; and that determination as to which such agency has responsibility for and direction of any such activity shall be made by the President in conformity with section 201 (e).[57]

This was not terribly clear policy guidance, particularly as the entire nature of space exploration and exploitation was still vague and under development. It was also not very clear considering that the entire issue of which organization—ARPA or NASA—

57. Document II-17 in Logsdon, gen. ed., *Exploring the Unknown*, 1: 334-45.

would be responsible for human spaceflight was unresolved. For the time being, the military space program was under the control of ARPA in the Office of the Secretary of Defense. This was not popular with the military services, but it did serve to mitigate turf disputes over the proper location of space programs. Such decisions were made at the national level, and the services on their own were incapable of making significant movement on space programs with ARPA in control of initiating and budgeting programs. The Space Act made it clear that it was up to the president to decide which programs belonged where.

More importantly, the establishment of NASA to conduct scientific experiments in space undercut much of the Air Force's emerging justification for human spaceflight. The Air Force had proposed human spaceflight less for mission reasons than as an extension of aeronautical medicine—to study the reaction of the human body to spaceflight. This was now a mission that NASA was more appropriately suited to accomplish. Furthermore, if people were to be placed in space for prestige reasons, the civilian program was more suitable for this from a propaganda standpoint. The Air Force was thus largely left with the search for a practical reason to put people in space. As robotic systems improved, this practical justification became more and more elusive. Finally, in August 1958, Eisenhower formally assigned the role of human spaceflight to NASA.[58]

Over time, the issue of where to conduct human spaceflight began to be resolved by top officials. For instance, by November 1958, only two months after NASA officially came into being, NASA Administrator T. Keith Glennan and ARPA Director Roy Johnson signed a memorandum of understanding concerning a "Program for a Manned Orbital Vehicle." [II-8] This was to supplement the Dyna-Soar vehicle development (whose exact status had not been clearly defined, although it stayed within the Air Force and did not come under the control of ARPA). Eventually, the ballistic capsule concept totally migrated over to NASA. As long as the Air Force continued to have its own human spaceflight program, top Air Force officials did not complain too much about losing the less interesting ballistic capsule vehicle.

Other areas proved more contentious, however. NASA had acquired the three NACA research centers and their heavy emphasis on aeronautics research. But the new space agency lacked expertise in other areas, particularly the key ones of satellite and rocket development. It became obvious that NASA would have to acquire these as well. In the meantime, the Army was launching lunar and scientific probes on behalf of NASA, including Pioneer III, which traveled 63,580 miles toward the Moon, and Explorer IV, which took radiation measurements in space.

The obvious choice was for NASA to acquire the Army's JPL, which had technical expertise in the areas of guidance, communications, telemetry, rocket propellants, and satellites. JPL was primarily a research center, and the Army could continue to benefit from its research no matter who operated it. On December 3, 1958, the Army transferred JPL to NASA, along with its Explorer satellite program.[59] [II-9]

The other obvious entity to turn over to NASA was the ABMA in Huntsville, Alabama, which had produced the Jupiter and Redstone rockets. Jupiter was an IRBM and fulfilled the same role as the Air Force's Thor. Its days as a weapons system were limited. The ABMA had other rocket programs in the works. In October 1958, with the concurrence

58. Loyd. S. Swenson, Jr., James M. Grimwood, and Charles C. Alexander, *This New Ocean: A History of Project Mercury* (Washington, DC: NASA SP-4201, 1966), pp. 101-102.

59. Eddie Mitchell, *Apogee, Perigee, and Recovery: Chronology of Army Exploitation of Space,* N-3103-A (Santa Monica, CA: The RAND Corporation, 1991), p. 24.

of ARPA, the ABMA had initiated an effort known as Juno V, which was soon to be renamed Saturn. Juno V was a space rocket, not a missile, and the ABMA's other work was not in the IRBM or ICBM field (the latter being the exclusive domain of the Air Force).

However, the ABMA represented the Army's last vestige of long-range missile work, a concept that it had pioneered in the post-war years. Unlike JPL, it was also a major development command and, as such, represented a significant amount of money. The Army was therefore reluctant to give it up, especially if the money would no longer appear in the Army budget as well. There was even the appalling (for the Army) possibility that the Saturn rocket could be turned over to the Air Force.

Rather than turning the center over to NASA immediately, the Army negotiated to do this gradually. Eisenhower disagreed with this strategy, but he was willing to let NASA Administrator T. Keith Glennan work it out. [II-10] The Redstone program was transferred to NASA on December 3, 1958, and then the Saturn program was transferred in November 1959. Finally, from March through July 1960, the Army transferred the ABMA Development Operations Division, which included the 150 German scientists and engineers, 3,900 ABMA personnel, and 2,500 missile and satellite technicians. [II-11] The Army was officially out of the space business.

While NASA was busy acquiring facilities and personnel from the Army, it was also using the services of the Air Force and forging various agreements with that military service, particularly for the use of its powerful missile, the Atlas, as well as its ground stations. Paying for these systems became an issue; NASA and DOD signed an agreement in November 1959 for the reimbursement of costs. [II-12]

The move of the ABMA to NASA was the second important step in the creation of duplicative tasks for the civilian and military space programs. But it seems to have aroused little concern within the Eisenhower administration.

Although the core of NASA consisted of NACA, as the organization grew, it took on aspects of both the Army and the Air Force approaches to ballistic missile development. The Army approach centered on the arsenal system, which involved heavy in-house development of weapons using both uniformed personnel as well as civilian Army employees, but relatively few outside contractors. The Air Force adopted a more open, contractor-oriented approach; direction remained within the military, but civilian contractors did a large amount of the research and development work. NASA adopted both of these practices over time. As it rapidly acquired former Army laboratories, it developed a strong in-house technical capability for the development of hardware. But key NASA managers also came to the agency from the Air Force and brought with them both their experience and expertise of working with aerospace contractors, as well as long-standing close relationships with such contractors.[60]

A Rocky Road to Cooperation

The Space Act included provisions for a "Civilian-Military Liaison Committee," in which NASA and DOD were expected to "advise and consult with each other on all matters within their respective jurisdictions relating to aeronautical and space activities and shall keep each other fully and currently informed with respect to such activities." But almost from the beginning, this committee did not work very well.

60. For a discussion of the evolution of NASA as an institution, see Chapter IV in Logsdon, gen. ed., *Exploring the Unknown*, 1: 611-29.

In a December 15, 1958, interagency meeting on U.S. launch vehicles, representatives of the Air Force Ballistic Missile Division (AFBMD), speaking for ARPA, had discussed their upper stage vehicles with NASA. However, they failed to mention the Agena B vehicle, which at the time was being considered for the CORONA and SAMOS reconnaissance satellites, as well as other payloads. NASA representatives discussed their Atlas-Vega vehicle. Vega was to be a two-stage addition to the Atlas. The second stage would be powered by a 33,000-pound thrust, liquid oxygen-kerosene engine. The third stage was to be a restartable 6,000-pound thrust, storable-propellant engine developed by JPL.

On January 16, 1959, the AFBMD ordered Lockheed to initiate a study and a test program for a restartable booster. This occurred only a day after Convair submitted a proposal for a medium-energy upper stage for the Atlas-Vega. A week and a half later, on January 27, NASA listed the Atlas-Vega as the first in a series of upper stage vehicles for use in the national space program.[61] NASA signed contracts for the Atlas-Vega in March and May of that year. In April and June, the AFBMD had worked out details for the Agena B with Lockheed and authorized formal development work—without notifying NASA.[62]

Gradually, word of the Agena B reached NASA officials, and by December 1959, NASA canceled the Vega as redundant. This duplication of effort had cost the country $16 million. A Government Accounting Office review of the program placed most of the blame on the Air Force for not informing NASA of its ongoing program.[63] The Civilian-Military Liaison Committee had been intended to preclude just such a duplication of effort, and it had failed because the Air Force decided to keep part of its program secret from another government agency. A year later, in September 1960, the Civilian-Military Liaison Committee was eliminated, and NASA and DOD signed an agreement creating an Aeronautics and Astronautics Coordinating Board. [II-13] Over the years, the importance of the board has varied, depending on the issue and the personnel participating in it.

Taking the Military Space Program Away From ARPA

ARPA was never very popular with the military services. It removed a number of key space programs from service control and placed it within DOD itself. Although the services bowed to this reality, it became increasingly irksome to them as time went on. In March 1958, soon after its creation, Director Roy Johnson informed the service secretaries that he would bypass the service chiefs and deal with the heads of the commands directly.[64] Soon thereafter, the services began losing each of their programs.

When the structure of ARPA came up for review a year later, Air Force Brigadier General James F. Whisenand, Special Assistant to the Chairman of the Joint Chiefs, stated in a February 1959 memorandum to General Nathan Twining (the Chairman): "From the military viewpoint, we would hope that ARPA would be phased out eventually and that [the Office of the Secretary of Defense] could get back solely to policy direction."[65]

There was also concern that the Air Force would predominate once ARPA was eliminated. A Department of the Army space policy in February clearly stated that the Army would have a subordinate role in the national space program. But it also stated that in its view, "Space is a new largely unknown medium which transcends the exclusive inter-

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61. "A National Space Vehicle Program," NASA, January 27, 1959, NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, DC.

62. Paul Means, "How the Two Programs Progressed," *Missiles and Rockets*, June 20, 1960, p. 20.

63. Paul Means, "Vega-Agena-B Mix-Up Cost Millions," *Missiles and Rockets*, June 20, 1960, p. 19.

64. Bowen, *The Threshold of Space*, p. 24.

65. Brigadier General James F. Whisenand, Special Assistant to Chairman, Memorandum for General Twining, "DOD Charter for ARPA," February 16, 1959, Record Group 218, Records of the U.S. Joint Chiefs of Staff, Chairman's File, General Twining, 1957-1960, Box 34, "471.94 (1959)." National Archives.

est of any service. . . . No military department should be assigned sole responsibility for space activities."[66]

This situation also was unacceptable for the Navy. In April 1959, the chief of naval operations urged the Joint Chiefs of Staff to create a single military space agency. The Army, rapidly losing its space program to NASA, agreed. The Air Force chief of staff objected that this would remove the weapons systems from the unified commands. By July 1959, White House and DOD officials began evaluating this separate military space agency. It would report directly to the Joint Chiefs of Staff, and command would rotate among the services. It was tentatively called the Defense Astronautical Agency.[67] [II-14]

In September 1959, Defense Secretary Neil McElroy rejected the proposal for a separate military space agency. Furthermore, he removed military space from ARPA and gave it back to the separate services. Booster development was transferred to the Air Force, and payload development went to the Army, Navy, and Air Force based on competence and primary interest. Under this plan, the Saturn rocket was expected to be turned over to the Air Force. This ultimately did not happen, however, as administration leaders recognized that there was no military need for such a large booster; a month later, Saturn was turned over to NASA.[68]

During the first two years after Sputnik, there was a considerable philosophical change in the Eisenhower administration's approach toward space. Eisenhower had initially opposed the creation of a separate civilian space agency, which he thought would duplicate capabilities already at DOD. Yet he had been convinced to create NASA. His top officials, such as Killian, had also initially opposed the idea of giving NASA programs that duplicated those in the military services. However, first the ballistic space capsule and then Saturn and ABMA's rocket development facilities were given to NASA.

These later moves, in particular, were a much more dramatic shift. Giving NASA its own rocket development capability directly duplicated capabilities that *could* have been left solely with the Air Force, but they were not. This split—and the establishment of separate civilian and military rocket production facilities—was to have a profound effect on the relationship between NASA and the Air Force for years to come. In military terms, it created separate "stovepipes" that duplicated missions and capabilities. The creation of the National Reconnaissance Office only a few years later added a third stovepipe to the national space program, adding even more duplication. Gradually, by accretion and usually without much second thought, the separate programs grew beyond what Eisenhower had originally wanted when he created ARPA in early 1958.

The New Era

By the end of 1959, the Air Force had regained from ARPA control over most of its space program. Furthermore, it had been made lead authority for developing large military boosters. With the Army out of the picture, the Air Force was now clearly the premier military space agency.

The Air Force also had not abandoned some of the expansive dreaming that had begun in the immediate post-Sputnik period. In April 1960, the AFBMD produced a secret report for a "Military Lunar Base Program or S.R. 183 Lunar Observatory Study."

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66. Office of the Adjutant General, Headquarters, Department of the Army, *Department of the Army's Interest, Capability, and Role in Space,* February 25, 1959, Record Group 218, Records of the U.S. Joint Chiefs of Staff, Chairman's File, General Twining, 1957-1960, Box 34, "471.94 (1959)," National Archives.

67. Bowen, *The Threshold of Space,* pp. 30-32.

68. *Ibid.,* p. 33.

[II-15] The base was billed as a "manned intelligence observatory" that could be developed into a "Lunar Based Earth Bombardment System." According to the report, the decision to place strategic weapons on the Moon could be deferred for a few years. "However, the program to establish a lunar base must not be delayed and the initial base design must meet military requirements. For example, the base should be designed as a permanent installation, it should be underground, it should strive to be completely self-supporting, and it should provide suitable accommodations to support extended tours of duty." The report recommended that "[t]he program for establishing a military lunar base be recognized as an Air Force requirement."[69]

The Air Force clearly still had its own designs on a large human spaceflight program. Within this atmosphere, on April 14, 1960, Air Force Chief of Staff Thomas D. White sent a letter to his staff, stating:

I am convinced that one of the major long range elements of the Air Force future lies in space. It is also obvious that NASA will play a large part in the national effort in this direction and, moreover, inevitably will be closely associated, if not eventually combined with the military. It is perfectly clear to me that particularly in these formative years the Air Force must, for its own good as well as for national interest, cooperate to the maximum extent with NASA, to include the furnishing of key personnel even at the expense of some Air Force dilution of technical talent. [II-16]

Unfortunately for White and the Air Force, the memorandum was leaked to Congressman Overton Brooks, the chair of the House Committee on Science and Astronautics. As Brooks characterized it, the statement indicated that White thought "that the military would ultimately take over NASA."[70] There was also much speculation within the press about the possible consolidation of the military and civilian space programs.

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69. The ideas of military bases on the Moon and orbital weapons were not new. One of the first mentions of orbital bombardment weapons appeared in *Forbes* magazine in 1946 (see Document II-1 in Logsdon, gen. ed., *Exploring the Unknown*, 1: 230-36). Apparently the first mention of a lunar-based bombardment system appeared in *Collier's* magazine in 1948 (see Robert S. Richardson, "Rocket Blitz From the Moon," *Collier's*, October 23, 1948, pp. 24-25; 44-46). Noted science fiction author Robert A. Heinlein used the idea of space bombardment in a short story called "The Long Watch" in *American Legion Magazine* in December 1949—and again in his popular novel *Space Cadet*. The same week that the creation of ARPA was being finalized, Brigadier General Homer A. Boushey, Air Force Deputy Director for Research and Development, wrote an article that advocated a lunar base as the ultimate deterrent (see Brig. Gen. Homer A. Boushey, "Who Controls the Moon Controls the Earth," *U.S. News & World Report*, February 7, 1958, p. 54). See also Lt. Col. S.E. Singer, "The Military Potential of the Moon," *Air University Review* 11 (1959), pp. 31-53. But by far the most noteworthy study was conducted by von Braun and his team at the ABMA, known as Project Horizon. It was presented in June 1959, and one of the justifications was the basing of weapons on the Moon to provide "International Law Enforcement" (*Project Horizon, Phase I Report*, Volume I, June 8, 1959, Space Policy Institute Documentary History Collection). Rather surprisingly, the Army was still discussing lunar bases long after the Apollo program was under way (see, for instance, *Space Information Briefing*, March 30, 1966, Future Weapons Office, R&D Directorate, U.S. Army Weapons Command, Space Policy Institute Documentary History Collection).

70. *Defense Space Interests*, Hearings Before the Committee on Science and Astronautics, U.S. House of Representatives, 87th Cong., 1st sess. (Washington, DC: U.S. Government Printing Office, 1961), p. 91.

Robert S. McNamara and the "National Space Program"

Soon after the Kennedy administration took office on January 20, 1961, newly appointed Secretary of Defense Robert McNamara quickly put his own imprint on the military space program. On March 6, he issued a directive to the secretaries of the military services stating: "I have decided to assign space development programs and projects to the Department of the Air Force, except under unusual circumstances."[71] Such assignment, McNamara stated, was not to predetermine the assignment of operational responsibilities for the space systems. In addition, preliminary research could still be conducted by the individual services, but it would eventually have to be transferred to the newly created director of defense research and engineering for evaluation before proceeding to development. In light of that, "[r]esearch, development, test, and engineering of Department of Defense space development programs or projects, which are approved hereafter, will be the responsibility of the Department of the Air Force." [II-17]

Taken together, both memoranda made outside observers believe that the Air Force was about to attempt to take control of the majority of the civilian space program. In March 1961, Overton Brooks called hearings to discuss the issue. He was also concerned about the report of President Kennedy's transition group for space, which indicated that NASA was to be responsible for scientific research, while the military would play the predominant role in developing space systems. Shortly before the hearings began, he sent a letter to Kennedy asking for clarification on the matter. [II-18]

During the course of the hearings, General Thomas D. White declared that the leaked memorandum, which had caused such consternation in the press and the committee, was only a general marching order to his staff to *improve* its cooperation with NASA; it did not indicate any planning to take over NASA. General Bernard Schriever, then commander of the Air Research and Development Command, admitted that he was mostly to blame for White's memorandum, because he had resisted the transfer of Air Force personnel to NASA. White was trying to indicate to Schriever that he was not happy with this lack of cooperation. However, given the Air Force's secrecy over the Agena B, and its continuing expansive space plans, it was conceivable that the service's top officials had at least some designs on NASA's turf.[72]

The result of the hearings, and of Brooks's letter to Kennedy, came in Kennedy's reply on March 23, the final day of the hearings. Kennedy stated:

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71. Robert S. McNamara, Secretary of Defense, Memorandum for the Secretaries of the Military Departments, *et al.*, March 6, 1961, reprinted in *ibid.*, p. 2.

72. Certainly, the Air Force was interested in expanding its missions and power. In the course of the hearings, White also denied that he wanted to gain control of all strategic nuclear forces, stating that "[t]he Air Force has no designs whatsoever, on the Polaris weapon system." *Ibid.*, p. 98. This question came up because sixteen months before White had sent a letter to the chair of the Joint Chiefs of Staff requesting that he recommend to the secretary of defense that he "assign control of the Polaris weapon system to the Strategic Air Command in view of its strategic capabilities." General Thomas S. Power, Commander in Chief, USAF, to General Nathan G. Twining, Chairman, Joint Chiefs of Staff, October, 1959, Record Group 218, Records of the U.S. Joint Chiefs of Staff, Chairman's File, General Twining, 1957-1960, Box 34, "471.94 (1959)," National Archives. After a protest from the Navy, the Air Force backed away from this request. White's actions, as well as those of others in the Air Force, indicate that the service was obviously interested in empire-building, but the uniformed leadership was being less successful at it than they had hoped. For a further discussion, see David Alan Rosenberg, "The Origins of Overkill: Nuclear Weapons and American Strategy, 1945-60," *International Security* 7 (Spring 1983): 3-71.

It is not now, nor has it ever been, my intention to subordinate the activities in space of the National Aeronautics and Space Administration to those of the Department of Defense. I believe, as you do, that there are legitimate missions in space for which the military services should assume responsibility, but that there are major missions, such as the scientific unmanned and manned exploration of space and the application of space technology to the conduct of peaceful activities, which should be carried forward by our civilian space agency. [II-19]

Kennedy's letter thus made it clear to the Air Force that NASA would have primary responsibility for both human spaceflight and the development of space technology in general. At the same time, he acknowledged a clear military role in space. This attitude would become clearer less than two months later with a joint memorandum to the president from NASA Administrator James E. Webb and Secretary of Defense Robert McNamara. The "Webb-McNamara Memo," as it became known, stated that space projects could be undertaken for one of four possible reasons. The first was scientific knowledge, the second was commercial/civilian value, and the third was military missions. The final reason was for purposes of national prestige. Such missions were "part of the battle along the fluid front of the cold war."[73]

This was in stark contrast to the position of President Eisenhower, who had explicitly rejected national prestige as a reason for space exploration and attempted to restrict both NASA and the military to strict utilitarian missions. By embracing their own view, and by calling explicitly for an "integrated" space program, Webb and McNamara also indicated that large, "prestige" missions were best carried out within NASA. They essentially applied a "strict scrutiny" approach to military space programs. If the programs did not serve clear military needs, then they should be either turned over to NASA or abandoned altogether.

Blue Gemini

On May 25, 1961, President Kennedy committed the United States to a major new undertaking in space, expressly for the purposes of national prestige.[74] Project Apollo resulted in a dramatic infusion of funds to NASA, along with the decision to ensure that the United States was ahead in every area of space technology. NASA was selected as the primary—and most visible—instrument for accomplishing this. As NASA's leadership planned out its program for reaching the Moon, it became obvious that certain technologies and capabilities would have to be developed. Foremost among these was rendezvous in orbit. NASA quickly decided to develop a more advanced space vehicle than the Mercury to develop these new techniques and technologies. This first "operational" spacecraft was soon named Gemini.

As NASA increased in size and assumed a predominant role, its interests also tended to diverge at key points from those of DOD. On July 7, 1961, NASA Associate Administrator Robert Seamans proposed a joint study to determine mission models and requirements affecting the selection of large launch vehicles. NASA's Nicholas Golovin directed the study. As this study progressed, the different requirements and institutional interests of NASA and DOD became clear. Both agencies distanced themselves from the contents of the report. By the time the report was released on September 24, 1962, almost

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73. Document III-11 in Logsdon, gen. ed., *Exploring the Unknown*, 1: 439-52.
74. Document III-12 in *ibid.*, 1: 453-54.

a year later, it had been obvious for some time that there would be very little cooperation between NASA and DOD on large launch vehicles. [II-20] The result was a further solidification of entirely separate and redundant rocket development programs in the civil and military spheres.

In February 1962, during congressional hearings on the Air Force space plan, Air Force officials first broached the idea of an Air Force version of the Gemini spacecraft. The idea became firmer in June when the Air Force's Space Systems Division began looking at the use of Gemini hardware for a preliminary Air Force space station known as MODS (Manned Orbital Development System). The Space Systems Division had been given the task of acting as a contractor to NASA for providing launch and target vehicles for Gemini. In August, those at the Space Systems Division started referring to the Air Force plan as "Blue Gemini."[75]

Although not officially sanctioned at the top levels of the Air Force, Blue Gemini became more appealing as other Air Force programs were cut back or slipped in schedule. A planned satellite interceptor was cut in the fall of 1962, and Dyna-Soar was still a long way from its first flight. The possibility of acquiring a simpler vehicle than Dyna-Soar to accomplish the rendezvous and reconnaissance agendas for the other two programs became very appealing at many levels of the Air Force.[76]

Many at NASA did not oppose the possibility of the Air Force taking a bigger role in the development of Gemini; they thought that DOD money flowing into the program could only help its development. In November 1962, the NASA Gemini program team met with representatives of the Air Force's Space Systems Division to discuss the coordination between the agencies. Soon after, NASA Administrator James Webb and Associate Administrator Robert Seamans visited the Pentagon to discuss increased DOD participation in Gemini with Deputy Secretary of Defense Roswell L. Gilpatric. However, Secretary of Defense McNamara was also there, and he surprised all of them by proposing the merging of the NASA Gemini program office with the Air Force office and moving it all to DOD.[77]

Retired Admiral W. Fred Boone became NASA Deputy Associate Administrator for Defense Affairs on December 1, 1962. Boone soon began working in earnest to build support against such a move. In early January 1963, NASA officials met with Pentagon officials and convinced them that taking over Gemini was a bad idea. McNamara and Gilpatric backed away from the takeover idea, but McNamara pushed for a joint management board for Gemini.[78]

In January 1963, Webb wrote Secretary of Defense McNamara and stated unequivocally his opposition to the joint management board for Gemini. [II-21, II-22, II-23] Webb had a major argument on his side; Gemini was vital to achieving the lunar goal, and DOD could not interfere with that mission. For DOD, Gemini was intended to be used to explore the utility of human spaceflight for the military—it was a much more open-ended and ambiguous mission. At the same time, there were those in the Air Force who were opposed to taking over Gemini because it would increase the chance of Dyna-Soar being killed. McNamara had to back away from the Gemini takeover attempt and ultimately accepted the creation of a Gemini Program Planning Board, which did not significantly alter the relationship between the actors.[79]

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75. Barton C. Hacker and James M. Grimwood, *On the Shoulders of Titans: A History of Project Gemini* (Washington, DC: NASA SP-4203, 1977), p. 118.
76. *Ibid.*
77. *Ibid.*, p. 119.
78. *Ibid.*, p. 120.
79. *Ibid.*, pp. 121-22.

In this context, and as Dyna-Soar moved toward the construction of hardware, that program became increasingly difficult for the Air Force to justify convincingly. Its proponents were forced to grasp at whatever justification they could find. Dyna-Soar was to be a reconnaissance craft. It was to be an offensive weapon, capable of striking the Soviet Union from virtually any direction, dropping up to two nuclear warheads. It was also to be an anti-satellite weapon, capable of destroying Soviet reconnaissance satellites. Some of these missions, however, could be accomplished more cheaply and more immediately with robotic spacecraft. Others, such as the bombing mission, were not really needed. Furthermore, as long as the fundamental utility of human spacecraft for military missions was in doubt, it made no sense to rely on a technologically challenging program to prove their worth. Gemini was perfect at the time for demonstrating the military value of human spaceflight because it was cheaper and easier than Dyna-Soar. The Air Force still remained wedded to the image of flying Air Force pilots in space, but this was an image that was more emotional than logical.

In April 1963, President Kennedy asked Vice President Johnson to conduct, in his role as chair of the National Aeronautics and Space Council, an overall review of the "national space program." [II-24] McNamara was asked to report to Johnson on this issue and did so, commenting that he and NASA Administrator Webb had worked hard to eliminate duplication between the civilian and military space programs. [II-25] The idea of a "national space program" was not McNamara's alone; indeed, the term had been used during the prior administration. But McNamara, with his dedication to efficiency, was the person most concerned about eliminating duplicative and wasteful programs.[80] McNamara was expansive in his view of his mission as well, and he was willing to reach beyond the DOD budget and programs to attempt to acquire or even to eliminate programs in other organizations that he did not see as worthwhile. Striving for McNamara's definition of "efficiency" was not always easy, but this was a central factor in DOD-NASA relations during much of the first decade of the space program.[81]

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80. The strive for efficiency was felt in other areas as well, including a major fight in late 1962 and early 1963 over whether or not the CIA's presence in the ultra-secret National Reconnaissance Office was still necessary. McNamara thought it was duplicative and wasteful and felt that the Air Force should run all satellite reconnaissance. He lost this fight. See Albert D. Wheelon, "Lifting the Veil on CORONA," *Space Policy* 11 (November 1995): 252-53.

81. There was, however, an example of duplication in space programs that proved in the end to be positive. This centered on the meteorological satellite programs. NASA inherited its Television and Infrared Operational Satellite (TIROS) system from the Army. The first TIROS flew in April 1960. NASA and DOD began negotiating on the development of an operational system in October, but by December, Air Force Commander in Chief Thomas S. Power expressed an interest in the Air Force controlling the operational system to provide weather data to its forces and also to be used for reconnaissance satellite flights. Negotiations continued for several months before the Air Force withdrew and began its own program, within the secrecy of the National Reconnaissance Office (it was later apparently turned over to the Strategic Air Command). NASA and the National Weather Bureau signed a joint agreement to cooperate on the development of an operational satellite in January 1962, but the program did not proceed very well because of conflicts between the partners, and the Weather Bureau withdrew in September 1963. Then the Weather Bureau approached the Air Force for access to its system. TIROS IX was launched in 1966 and was based on the Air Force's satellite design. The majority of this story still remains classified, but it provides an interesting counter to McNamara's arguments for efficiency in the national space program. See Janice Hill, *Weather From Above* (Washington, DC: Smithsonian Institution Press, 1991), pp. 22-26. See also General Thomas S. Power, Commander in Chief, Strategic Air Command, to General Thomas D. White, December 1, 1960, Box 34, "2-15 SAC," Papers of Thomas D. White, Library of Congress, Washington, DC.

In March 1963, McNamara still had not made up his mind about the desirability of Dyna-Soar. He felt that the Air Force had not concentrated enough on exactly what it was to do in orbit, focusing solely on its flying characteristics. He suggested several missions that should be evaluated, including inspection and kill, reconnaissance, the vulnerability of space vehicles, and orbital weapons. But he was also interested in the test bed possibilities of any spacecraft and voiced this in a meeting with Boeing and NASA officials. One NASA official stated that according to the Space Act, such joint use might create a conflict, because regulations dictated that NASA was not to be involved in weapons development. McNamara responded to this with scorn, stating that he was willing to change the law if necessary.[82] His view of his authority and mission was quite expansive indeed.

During the summer of 1963, the Air Force began to seriously consider an orbital space station. It received authorization from the director of defense research and engineering to study the issue. The space station was not to be an end in itself; rather, it was to be used to "demonstrate and assess qualitatively the utility of man for military purposes in space."[83] The Air Force's initial study was completed by November, and it assessed a number of options, including the use of Gemini and Apollo spacecraft to service the military space station.

Dyna-Soar was an arguably duplicative program and also one that was becoming increasingly expensive as it moved away from purely theoretical research and into the development phase. In addition, Kennedy had been elected to some degree on the propaganda scare of a nonexistent "missile gap," from which he and McNamara later had to retreat. Kennedy's actions after the Cuban missile crisis of 1962 and the Nuclear Test Ban Treaty of 1963 also symbolized a movement away from boisterous displays of nuclear capabilities. In light of these events, as well as ongoing public and congressional concerns about "the militarization of space," the image of a piloted space bomber swooping in from orbit to obliterate Moscow became distinctly unattractive to the administration.

Another problem with Dyna-Soar was that the basic utility of humans for military space missions was in doubt. It was to be proven or disproven with the military space station, which was itself an experimental vehicle. Identifying the utility issue did not require an experimental vehicle, and using an experimental spacecraft to service an experimental space station seemed to be too risky and too expensive.

By 1963, the Kennedy administration was very aware of the value of satellite reconnaissance. It had even evaluated the possibility of sharing U.S. reconnaissance data with other nations. Satellite reconnaissance was viewed as a valuable national asset, not merely a military war-fighting tool. But the Air Force apparently continued to view reconnaissance solely in terms of military capabilities and thus sought a way of neutralizing Soviet reconnaissance satellites—doing so in a highly visible manner.

In short, Dyna-Soar would militarize space in all the ways that the administration did not want to see it militarized. It was largely unjustified and duplicative of missions that NASA was already conducting. It also now stood in the way of identifying clear military space missions for humans. Thus, by late 1963, Dyna-Soar was in clear trouble with Defense Secretary McNamara. The response from the Air Staff was a letter to the secretary of the Air Force outlining several space station missions, all involving Dyna-Soar. If money was a problem for the national space program, suggested the assistant to the vice

82. Brockway McMillan, Assistant Secretary for Research and Development, "Memorandum for Secretary Zuckert," March 15, 1963, Space Policy Institute Documentary History Collection.

83. Harold Brown, Director of Defense Research and Engineering, to Secretary of the Air Force, "Military Orbiting Space Station," August 30, 1963, Space Policy Institute Documentary History Collection.

chief of staff, then it was always possible to cancel Gemini (its role in the Apollo program was ignored).[84] This last ditch, vindictive effort to save Dyna-Soar failed.

On December 10, 1963, McNamara canceled the Dyna-Soar program. As consolation to the Air Force, DOD authorized money for a Manned Orbital Laboratory program utilizing the Gemini spacecraft. This laboratory program would continue for another five years, serving as the Air Force's hope for flying its own pilots in space. The laboratory was to serve as an occupied, real-time reconnaissance spacecraft with multiple cameras, demonstrating various reconnaissance and surveillance technologies. However, at the beginning of its life, the Manned Orbital Laboratory, similar to Dyna-Soar, was amorphous, with no clear, overriding purpose other than technology development and the ever-persistent Air Force desire to fly its own astronauts in space.

At the same time, NASA was investigating the possibility of developing a space station, and cooperation with DOD on this matter was only natural. [II-26, II-27] The two organizations even signed an agreement for the creation of a Manned Space Flight Experiments Board. [II-28] The agreement established the principle of reciprocity and the sharing of flight opportunities between NASA and DOD for both Apollo and the Manned Orbital Laboratory.

By 1968, the Manned Orbital Laboratory had solidified significantly and was to include a massive camera system with a ground resolution of four inches. The officers aboard it were to provide near real-time reconnaissance of the Earth. This had been an early goal of the Air Force's WS-117L and SAMOS programs, but it had proven a difficult one to achieve because of the technological challenges. The CIA had successfully developed its CORONA reconnaissance system, which, by the late 1960s, had already flown more than 100 missions and proved an astounding success. The Air Force had chosen another route, developing "close-look" systems for the technical assessment of Soviet weapons, but the service had never abandoned its desire for real-time reconnaissance. CORONA photographs could take more than a day to reach Washington and photo-interpreters. The Air Force wanted to reduce this to hours or less; such a quick turn-around would enable the photographs to be used in battlefield operations. This coincided well with the Air Force's dream of flying Air Force officers in space—hence a major impetus behind Dyna-Soar and, later, the Manned Orbital Laboratory.

With the Vietnam War waging, the DOD budget was under extreme pressure. The Manned Orbital Laboratory was the largest single item in the DOD budget and therefore an obvious target for being cut. In 1968, the laboratory was doomed, but it survived for one more year and the election of another president (Richard Nixon). Then it was killed. Once again, the Air Force's attempt to fly military officers in space had been thwarted.[85]

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84. Major General J.K. Hester, Assistant, Vice Chief of Staff, HQ, Air Force, Memorandum to the Secretary of the Air Force, "Approaches to Manned Military Space Programs," December 4, 1963, Space Policy Institute Documentary History Collection.

85. The Manned Orbital Laboratory had also run afoul of other developments and a shortage of funds, this time not because of NASA, but from a different source entirely—the CIA. By the late 1960s, the CIA was beginning to develop its follow-on to the highly successful CORONA series of wide-area surveillance satellites. The CORONA follow-on and the Manned Orbital Laboratory, which were intended to perform entirely different missions, were competing with each other for funding within the highly secret world of the National Reconnaissance Office. Furthermore, the laboratory ran into some of the same problems as its linear predecessor, Dyna-Soar; it was far too visible for its own good, especially for a reconnaissance system. In a contentious meeting at the National Photographic Interpretation Center in 1968, Vice President Hubert Humphrey, chair of the National Aeronautics and Space Council, repeatedly complained that the Manned Orbital Laboratory would not be able to fly without "Walter Cronkite looking over your shoulder." While the nation's other reconnaissance satellite programs had remained remarkably secret, the laboratory had attracted much attention within the press and Congress. It had become a political football in Congress, where angry Florida senators and representatives wanted to know why the space station had to fly out of Vandenberg Air Force Base, California.

Human spaceflight was one of the key issues of military-civilian cooperation. During the 1960s, NASA had clear justifications for flying humans in space—medical research and prestige. The Air Force did not have these clear justifications, and its human spaceflight program was thus focused first on demonstrating the utility of astronauts for military space missions. In the end, the Air Force *failed even to justify flying astronauts simply to perform this evaluation,* let alone to serve practical purposes in space. Robotic spacecraft as well as NASA experiments undercut the tenuous justifications the Air Force had advanced even for experimental missions. The costs were simply too high and the benefits viewed as too elusive. The experience with both Dyna-Soar and the Manned Orbital Laboratory apparently taught the senior uniformed leadership at the Air Force a lesson, and they were forever after very skeptical of human spaceflight.

The Military and the Space Shuttle

In early 1969, President-elect Richard Nixon appointed a Space Task Group to address the issue of the post-Apollo space program. Vice President-elect Spiro Agnew was appointed chair of the group, and its other members were NASA Administrator Thomas O. Paine and Secretary of the Air Force Robert C. Seamans (who had been deputy administrator at NASA). On March 22, 1969, the Space Task Group met to discuss the joint development of a Space Transportation System (STS). Less than two weeks later, on April 4, Paine asked Seamans to approve a joint NASA-Air Force study of an STS.[86]

The conclusion of the Space Task Group was that the country should undertake an ambitious space exploration program involving landing humans on Mars and developing a lunar base and space station. These missions would be serviced by a reusable Space Shuttle, intended to reduce the costs of transportation. President Nixon, however, did not accept this report and only gave his initial approval to the space station and shuttle options, postponing the former and tentatively agreeing to the latter.[87]

NASA and the Air Force had diverged on the issue of large launch vehicle development seven years before. While NASA developed the Saturn IB and the much larger Saturn V, the Air Force developed its Titan series of boosters. Versions of the Titan were used for ICBMs and various reconnaissance missions, and even larger versions were developed first for Dyna-Soar and later the Manned Orbital Laboratory and CORONA follow-on. By early 1970, NASA officials such as Paine had recognized that DOD support would likely be essential for obtaining White House approval for the Space Shuttle program. NASA and Air Force officials met a number of times to discuss the design of the Space Shuttle and to establish terms of reference for such a system. [II-29]

In February 1970, NASA and the Air Force signed a joint agreement to cooperate by establishing a NASA-Air Force Space Transportation System Committee (STS Committee). They agreed that the program would be unclassified and would also involve international cooperation. Furthermore, both NASA and DOD would make substantial contributions to shuttle development and operations—which later became important for the establishment of shuttle pricing agreements. [II-30, II-31, II-32] The STS Committee was the mechanism through which the Air Force informed NASA of its requirements for

86. DOD prepared a massive report for the Space Task Group, which served as a basis for transportation mission models for the space shuttle. This document was essentially a listing of all possible DOD missions over the next several years. "DOD Space Programs, Options, Recommendations," August 7, 1969, Space Policy Institute Documentary History Collection.

87. Documents III-25 and III-26 in Logsdon, gen. ed., *Exploring the Unknown,* 1: 522-46.

the Space Shuttle. During its first year of operation, the STS Committee laid considerable groundwork for the shuttle's design.

NASA initially wanted a smaller shuttle with only limited cross-range (that is, the ability of the shuttle to travel to either side of its ground track during landing). Low cross-range meant relatively small, straight wings, while high cross-range meant larger, delta-shaped wings for more maneuvering. Smaller payload size and smaller wings would presumably result in a smaller, easier (to build), and, hopefully, cheaper shuttle.

The Air Force, however, had two primary requirements. One was the ability to launch the largest payload in its inventory, by then the CORONA follow-on satellite (which the CIA had eventually turned over to the Air Force for development), with a little extra room and weight for growth. The second was the ability to launch polar-orbiting reconnaissance satellites. Polar orbit could not be reached from Cape Canaveral without overflying inhabited areas, and such launches therefore flew out of Vandenberg Air Force Base in California, heading south. For the shuttle, this proved problematic, for if there was an abort during liftoff, the shuttle had to be capable of returning to California to avoid landing with a highly classified payload in the Soviet Union. The rotation of the Earth would cause California to move during that time period, and the shuttle needed to catch up with it. It therefore needed a high cross-range capability—1,100 miles—in addition to the large payload capability.

NASA's initial proposal was for a shuttle with a 14-foot by 45-foot payload bay, which would eventually be expanded to 15 feet by 60 feet at a future date. The Air Force strongly objected to this, because it could not use a payload bay smaller than 15 feet by 60 feet for key missions. The Air Force stated that of the 149 military payloads forecast to be flown between 1981 and 1990, 71 would not fit in the smaller payload bay. Without the larger bay, these missions would have to fly on Titan III boosters instead, undercutting the justification for the Space Shuttle.[88]

To gain the Air Force's support for the development of the shuttle, NASA agreed to both the payload and cross-range design requirements.[89] [II-33] In addition, to place large payloads in high-Earth orbit, a "space tug" was needed. NASA and DOD began negotiating on the development of this vehicle as well. [II-34]

According to NASA's early cost models for the shuttle's development, virtually all American payloads had to be shifted to the shuttle for the vehicle to be cost-effective. This meant, in effect, that other launch vehicle production had to be eliminated, but the Air Force had not explicitly agreed to this. In 1973, Malcolm R. Currie, Director of Defense Research and Engineering, wrote to the secretary of the Air Force stating, that uncertainties about the operational availability of the shuttle dictated the maintenance of a back-up launch capability using expendable launch vehicles.[90] With congressional pressure mounting on NASA because of rising shuttle costs, NASA Administrator James Fletcher wrote to Secretary of Defense James Schlesinger, asking for his continued support of the shuttle, as well as continued dialogue with NASA on the issue. [II-35] Schlesinger, along with Deputy Secretary of Defense William Clements, met with Fletcher in August 1976 to discuss the shuttle issue.

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88. For a fuller discussion of the technical tradeoffs involved in the shuttle design, see M. Scott Pace, "Engineering Design and Political Choice: the Space Shuttle 1969-1972," M.A. Thesis, Massachusetts Institute of Technology, 1982.

89. Documents III-28 and III-32 in Logsdon, gen. ed., *Exploring the Unknown*, 1: 546-59.

90. Malcolm Currie, Director of Defense Research and Engineering, to Dr. Robert C. Seamans, Secretary of the Air Force, "DOD Space Shuttle Planning," August 7, 1973, Space Policy Institute Documentary History Collection.

In a letter to Fletcher, Clements stated for the first time: "Once the Shuttle's capabilities and low operating cost are demonstrated we expect to launch essentially all of our military space payloads on this new vehicle and phase out of inventory our current expendable launch vehicles." [II-36] This letter, although not a specific policy directive, is apparently the first clear statement of DOD intent to rely exclusively on the shuttle for access to space. This policy was not quickly or easily accepted within the Air Force, and even two and a half years later, a joint memorandum of understanding on the management and operation of the shuttle notably did not state that the shuttle would be the exclusive means for access to space. [II-37]

Two months later, John J. Martin, Assistant Secretary of the Air Force (Research and Development), and John F. Yardley, NASA Associate Administrator for Space Flight, signed an agreement that determined what DOD would pay for shuttle launch services. For the first six years of operation, DOD would pay NASA what amounted to the incremental costs of materials and services. [II-38] This later led to charges in Congress and the press that NASA was giving the Air Force a preferential deal on shuttle flights to maintain its continued support. However, the Air Force had already agreed to significant costs of its own for using the shuttle.

The effects of the Air Force decision to cooperate with NASA on the shuttle were not felt for some time. There were gradual indications that this had been a mistake. The cost of developing a separate launch and landing facility at Vandenberg Air Force Base was increasing. It was planned that the shuttle use Space Launch Complex-6 (known as "Slick Six") at Vandenberg, which had originally been intended for Dyna-Soar, was then modified for the Manned Orbital Laboratory, and had never launched a single rocket despite the expenditure of billions of dollars. The modification of "Slick Six" was expected to cost even more money than planned.

In addition, the Air Force was looking at the possible procurement of its own orbiters, but as the development cost rose, this became less attractive. Finally, the decision to cooperate on the shuttle did not necessarily constitute an Air Force decision to make exclusive use of the shuttle for launching all payloads. However, the cost of supporting both the shuttle and the Air Force fleet of expendable boosters was also becoming apparent. By 1974, Secretary of Defense James Schlesinger and Secretary of the Air Force Malcolm Currie were becoming increasingly concerned about all of these costs.

NASA-Air Force relations during this time were not always cordial. As the shuttle design matured, NASA managers frequently made changes without including the Air Force in the decisions, only informing the service after the fact. Furthermore, the initial launch rate for the shuttle was set at 60 flights per year, with 40 from Kennedy Space Center and 20 from Vandenberg. NASA soon determined that this flight rate was unachievable without a five-orbiter fleet; in 1976, the space agency began calling for a fifth orbiter, expecting the Air Force to pay for it. The DOD leadership refused to acknowledge that its mission model dictated the need for the fifth orbiter, which it feared it would have to procure on its own. [II-39]

In 1977, Hans Mark became the new under secretary of the Air Force and the director of the National Reconnaissance Office. Mark previously had directed NASA's Ames Research Center and felt that the shuttle was in the best interests of the country. He entered office at a time when the shuttle was coming under increasing pressure from the new administration of President Jimmy Carter over cost increases and schedule delays.[91]

91. Document III-33 in Logsdon, gen. ed., *Exploring the Unknown*, 1: 559-74.

Mark was an ardent shuttle supporter and argued that the vehicle itself was an important contributor to national defense.[92] To further justify the shuttle, Mark chose to eliminate the option of "dual-compatibility" and shift key national security payloads to a "shuttle-compatible" only policy. According to a report at the time, this meant "a payload design compatible with shuttle launch: it may or may not be compatible with [expendable launch vehicle] launch. The term 'Shuttle optimized' implies a payload designed to exploit the unique capabilities of the shuttle—i.e., retrieval, on-orbit service, large weight and volume, etc. The 'Shuttle optimized' payload is not likely to be compatible with existing [expendable launch vehicle] launch capability."[93] In anticipation of using the shuttle's unique capabilities, the procurement rate of national security satellites was reduced during the 1970s until the shuttle became operational. The result of this decision was a "bow wave" of unfunded requirements that drove up DOD space spending in the 1980s.[94]

In 1981, President Ronald Reagan, despite the objections of the uniformed Air Force, directed the transition of all U.S. government payloads to the Space Shuttle as expeditiously as possible, once "the capabilities of the STS are sufficient to meet its needs and obligations."[95] As a result, a number of national security payloads were modified so that they could only fly on the Space Shuttle. This was to have a profound effect on the military and intelligence space programs later in the 1980s.

The Death of Military Human Spaceflight

By the time the Space Shuttle became operational in the early 1980s, it had changed considerably from what the Air Force had originally anticipated. The Air Force faced launch costs totaling nearly $300 million per flight. In August 1982, Air Force Systems Command Commander General Robert T. Marsh, who had responsibility for Air Force participation in the STS, informed Air Force Chief of Staff General Charles Gabriel of rising shuttle costs. [II-40] The shuttle did not fare well when compared to the Air Force's other heavy booster, the Titan III. Not only had shuttle costs risen, but when added to the Air Force's internal costs for personnel, hardware, mission control, and so on, the overall cost to the Air Force was much higher than expected. It was becoming obvious to many within the Air Force that the shuttle posed a *major* budgetary burden. In addition, the shuttle program was also considerably behind schedule and was unlikely to meet anticipated flight rates.

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92. See Hans Mark, *The Space Station: A Personal Journey* (Durham, NC: Duke University Press, 1987).

93. *Space Shuttle Appropriations for Fiscal Year 1979,* Committee on Appropriations, Hearings before Subcommittees of the Committee on Appropriations, U.S. House of Representatives, 95th Cong., 2d sess. (Washington, DC: U.S. Government Printing Office, 1980), p. 363.

94. From 1973 to 1976, DOD strove to design satellites for "dual-compatibility" with both the shuttle and expendable launch vehicles. This meant that the satellites had to be designed and tested in the different acoustic and dynamic environments of the shuttle and expendable launch vehicles. Such a design, however, proved to be more difficult in practice than in theory, because of widely different operating environments and other conditions. As a result, satellite program managers tended to defer changes until the next "block change" in the satellite, when the costs could be folded into other necessary design changes as well. Vice President's Space Policy Advisory Board, *A Post Cold War Assessment of U.S. Space Policy* (Washington, DC: U.S. Government Printing Office, December 1992), p. 6.

95. National Security Decision Directive 8, "Space Transportation System," November 13, 1981, and National Security Decision Directive 42, "National Space Policy," July 4, 1982, Space Policy Institute Documentary History Collection.

In March 1983, Lieutenant General Richard C. Henry, Commander of the Air Force Space Division, wrote a letter to General Marsh at the Systems Command. Henry expressed growing concern that carrying humans aboard a vehicle designed merely to deliver payloads to orbit created an unnecessary expense. After the initial ground-processing delays of the shuttle *Challenger,* Henry wrote:

A four orbiter-only fleet, experiencing problems similar to those of Challenger, would develop a backlog of launches that would take months to years to work off. This represents a considerable threat to the continued vitality of the national space program and in particular, could impact national security through inadequate launch support of priority DOD spacecraft.

Henry's letter outlined for the first time the idea of a "mixed fleet" of launch vehicles and also mentioned the possibility of commercializing launch vehicles, such as the Delta and the Atlas. [II-41] This was at a time when the Air Force was rapidly preparing to close down its expendable launch vehicle production lines.

DOD continued to support the shuttle despite strong reservations, particularly among top Air Force officers. In early 1984, however, Secretary of Defense Caspar Weinberger issued a directive that established a need for a complementary expendable launch vehicle to supplement the Space Shuttle. [II-42] This move was not popular with top NASA officials, who viewed it, correctly, as a lack of faith in the Space Shuttle, but they could not address the problem because it was an Air Force policy issue. In the Air Force's view, the Space Shuttle was nowhere near reaching its definition of "operational status," even more than three years since the first launch. [II-43] DOD initially ordered ten complementary expendable launch vehicles, based on a modified Titan 34D design. This eventually became known as the Titan IV.

A year after the complementary expendable launch vehicle decision, Undersecretary of the Air Force Edward C. Aldridge, who was also the director of the National Reconnaissance Office, discussed with NASA Administrator James Beggs the possibility of preserving other expendable launch vehicle lines in addition to the Titan. Having completed a competition to select the complementary expendable launch vehicle, Aldridge needed NASA to concur with the decision. He reached an agreement with Beggs, and this was taken to the National Security Council for the president's signature. It became National Security Decision Directive 164 (NSDD 164), "National Security Launch Strategy," signed on February 25, 1985, which stated that the shuttle would continue to be the primary space launch system for both the military and civilian space programs. This directive authorized DOD to develop the complementary expendable launch vehicle; it also stated that the two organizations should begin developing a second-generation STS. [II-44]

After the *Challenger* accident, however, the military was placed in a tremendous bind. Although DOD had already begun shifting some of its payloads away from the shuttle, it had also designed a number of them so that they could be carried *only* by the shuttle. With the primary launch vehicle for many of these payloads out of service for an indeterminate amount of time, the depth of the shuttle cooperation mistake became apparent to virtually everyone in the Air Force and DOD. Classified satellites that could only fly on the shuttle began to pile up at various "clean rooms" around the country, creating a backlog of payloads that needed to be in orbit. Furthermore, several other expendable launch vehicle failures at the same time left the United States grounded and resulted in the destruction of several valuable reconnaissance payloads. Finally, the on-orbit constellation of reconnaissance, early warning, communications, and other satellites continued to age.

For a period of several years, the United States was left with only one reconnaissance satellite in orbit, a situation that was totally unacceptable from a national security point of view.[96]

The Shuttle Legacy for NASA-DOD Relations

Air Force involvement in the shuttle came largely at the urging of the civilian leadership of the service, not the general officers or the Air Staff. This is not terribly surprising because the shuttle was a NASA-initiated program, and NASA officials had negotiated with their civilian counterparts in the Office of the Secretary of the Air Force. Assistant Secretary of the Air Force Grant Hansen was one of the principal contacts with NASA during early negotiations, as was Secretary Seamans. Later in the 1970s, Undersecretary of the Air Force Hans Mark further entwined the Air Force's fate with the performance of the Space Shuttle.

At the same time, support for involvement with the shuttle received only lukewarm response from uniformed personnel. This represented a decided shift from the previous major military space initiatives in the Air Force, where the uniformed officers had been pushing the programs and the civilian leadership—both at the secretary level and in the Office of the Secretary of Defense—had opposed them. This characteristic had begun with the WS-117L reconnaissance program, which had been underfunded by Secretary of the Air Force Quarles. It was also seen in such instances as General Schriever being warned by the Office of the Secretary of Defense not to use the word "space" in speeches. It was certainly common in the immediate post-Sputnik era, when the Air Staff had lobbied extensively for a number of new space missions, only to see its authority stripped by Secretary of Defense McElroy with the creation of ARPA. And it was in evidence under McNamara, when the Air Staff had bold plans for Dyna-Soar, which met opposition among the civilian leadership. It even applied to areas that were well within the Air Force's space mission, such as the development of the MIDAS early warning satellite, which McNamara refused to approve for operational development over the objections of Schriever and others.[97] By the time that the shuttle decision was made, however, the Air Staff had apparently lost much of its enthusiasm for space, particularly for human spaceflight missions. Why this is so is not clear. At the very least, solely military "man-in-space" missions were apparently out of the question, and cooperative missions with NASA were not particularly attractive to the uniformed military.

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96. A report by the Air Force's Scientific Advisory Board in June 1983 further symbolized the uniformed Air Force's move away from the dream of a military "man-in-space" program. A special Ad Hoc Committee on the Potential Military Utility of a Manned National Space Station concluded that the most valuable use to the military of a space station was the ability to conduct research and test new technology with human crews in attendance. However, the committee did not feel that this mission justified major involvement or funding; DOD could be a potential customer of the planned NASA space station once it was operational without being an active participant in designing, managing, or funding the station. This time, the Air Force, rather than striving to develop its own program for human spaceflight or even cooperating with NASA as it did with the shuttle, would be content to serve merely as a customer. This later caused some controversy when Secretary of Defense Weinberger insisted that no agreement be signed with an international partner that prevented the United States from conducting military experiments on the station.

97. General B.A. Schriever, Commander, Air Force Systems Command, to Eugene M. Zuckert, Secretary of the Air Force, "DOD Program Change (4.4.040) on MIDAS (239A)," August 13, 1962, Box B167, Curtis E. LeMay Papers, Library of Congress.

This is not to say that the civilian leadership of DOD in general, or the Air Force in particular, rushed enthusiastically into a major development project with NASA. Certain important members of DOD required much convincing before signing the agreements that increased cooperation with NASA on the Space Shuttle. Later on, in the 1980s, particularly under the leadership of first Undersecretary and then Secretary of the Air Force Edward Aldridge, the civilian leadership at the Air Force became particularly suspicious and distrustful of the total reliance on the Space Shuttle. It is also true that by the 1980s, the military space program had clear priority within the White House. Even the policy-making apparatus for space decisions, centered as it was in the National Security Council, was biased in favor of DOD over NASA.

The *Challenger* accident did not create the problems for DOD in general and the Air Force in particular in terms of cooperation with NASA. However, it did throw them into harsh relief; it confirmed the grumblings and second-thoughts of much of the uniformed military. All of this is important to recognize with respect to what happened later to Air Force-NASA relations—*Challenger* was not the cause, merely the most blatant symptom of a long-standing tension.

Civilian DOD officials typically serve no more than a single presidential term in office. Occasionally, they move to higher positions, but it is far more common that they leave the government altogether. They therefore rarely have to live with the long-term consequences of the policy decisions they make. The uniformed officers in a service, however, do remain. The mid-level officers frequently are given the task of implementing decisions made at higher levels and then may rise to general officer rank themselves years later, when they are faced with the consequences of the decisions made earlier. In the case of the shuttle decision, many Air Force officers who were colonels and lieutenant colonels at the time later rose to general officer rank when the true effects of the shuttle decision—particularly the higher costs and the schedule delays—were being felt. At that point, they were inclined to heavily resist any further cooperative efforts with NASA.

This was the legacy that NASA and DOD faced as the 1990s began. The situation was akin to what Mark Twain once said about a cat that sits on a hot stove top: it will never sit on a hot stove top again, but neither will it sit on a cold one. Thus, despite the change of the civilian political leadership at both DOD and NASA from both the change of administrations and simple personnel turnover, the institutional memory of the Air Force—its uniformed officers—remained highly distrustful of any cooperative agreement foisted on them by civilians.

Conclusion

The civilian-military relationship in space has been one that has evolved over time and continues to evolve to this day. Determining whether it has been a success or not is largely impossible, because the question depends on at what level one wants to look.

At the operational level, there has been much successful cooperation on all aspects of the space program. DOD provided facilities, material, and personnel in support of the civilian space agency. Navy ships conducted retrieval operations for NASA missions. Air Force personnel served in important positions in the Apollo program. DOD and NASA shared tracking and communications facilities for each other's programs. Even the highly secretive "black" intelligence programs have been used in the civilian space program. Optics developed for reconnaissance satellites found their way into Apollo and other space science missions. In fact, a reconnaissance satellite was even used to photograph the

Skylab space station soon after launch to assess the damage it incurred during liftoff. The photographs were used to train the NASA astronauts who flew the repair mission.[98]

At the policy level, it has been a different story. From the Air Force's perspective, the service has largely come up short—being relegated to less glamorous, but more vital roles in space, while also being forced to serve in a support capacity for NASA, which managed to take much of the credit. For the first decade of its existence, NASA reaped the fruits of much military spending and research on space and was frequently predominant in policy disputes. Beginning with the shuttle, NASA's dependence on the military for more than just operational support became blatantly clear. In the end, however, the Air Force seems to have suffered more from this situation as well.

By the early 1990s, the situation had become much more complex. Both NASA and DOD needed each other to find a solution to the problem of excessive launch costs. Perhaps more importantly, NASA began the painful transformation to a post–Cold War world much earlier than the military space program. Whether the military can learn from NASA's example awaits to be seen.

98. Dwayne A. Day, "The Air Force in Space: Past, Present and Future," *Space Times: The Magazine of the American Astronautical Society* 35 (March-April 1996): 17.

Document II-1

Document title: Major General L.C. Craigie, Director of Research and Development Office, Deputy Chief of Staff, Materiel, to Brig. Gen. Alden R. Crawford, Air Materiel Command, Wright Field, Dayton, Ohio, "Satellite Vehicles," January 16, 1948, with attached: Memorandum for the Vice Chief of Staff, "Earth Satellite Vehicles," January 12, 1948, and General Hoyt S. Vandenberg, Vice Chief of Staff, United States Air Force, "Statement of Policy for a Satellite Vehicle."

Source: NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

Following RAND's study titled "Preliminary Design of an Experimental World Circling Spaceship," published as Document II-2 in Volume I of Exploring the Unknown, *RAND conducted several more studies. The staff of Headquarters United States Air Force ordered the Air Materiel Command to evaluate RAND's studies. The Materiel Command returned a cautious report stating that the practicality of satellites was questionable and advised further study. As a result, the Air Staff authorized further study of the subject by RAND, and also stated that the Air Force was the logical service for developing satellite systems. This was the first definitive statement by the Air Force that it should have primacy in space systems.*

[no pagination] 16 January 1948

SUBJECT: Satellite Vehicles

TO: Commanding General
Air Materiel Command
Wright Field, Dayton, Ohio
Attn: Brig Gen Alden R. Crawford

1. Reference is made to memorandum dated 8 December 1947, file TSKON-9/MSR/loa, subject as above.

2. In line with the contents of referenced letter, the attempted statement of policy covering this matter has been formulated and approved.

3. It is requested that this policy be implemented by action under the RAND contract. This matter has been co-ordinated [sic] with the local RAND office.

4. The classification of this subject may be considered confidential with the exception of the attached policy statement.

BY COMMAND OF THE CHIEF OF STAFF:

L.C. CRAIGIE
Major General, U.S. Air Force
Director of Research and Development
Office, Deputy Chief of Staff, Materiel

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[no pagination] 12 JAN 1948

Memorandum for the Vice Chief of Staff

SUBJECT: Earth Satellite Vehicles.

DISCUSSION.

1. Progress in guided missile research and development by the Air Force, the Navy and other agencies is now at a point where the actual design, construction, and launching of an Earth Satellite Vehicle is technically, although not necessarily, possible. The passage of time, with accompanying technical progress, will gradually bring the cost of such a missile within feasible bounds.

2. It seems therefore, imperative, in order that the USAF maintain its present position in aeronautics and prepare for a future role in astronautics, that a USAF policy regarding Earth Satellite Vehicles be promulgated. A suggested policy is attached hereto.

RECOMMENDATION.

That the inclosed [sic] policy be approved.

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[no pagination]

Statement of Policy for a Satellite Vehicle

The USAF, as the Service dealing primarily with air weapons—especially strategic—has logical responsibility for the Satellite.

Research and development will be pursued as rapidly as progress is guided missiles are justifies and requirements dictate. To this end the problem will be continually studied with a view to keeping an optimum design abreast of the art, to determine the military worth of the vehicle—considering its utility and probably cost—to insure development in critical components, if indicated, and to recommend initiation of the development phases of the project at the proper time.

HOYT S. VANDENBERG
General, United States Air Force
Vice Chief of Staff

Document II-2

Document title: Robert R. Bowie, Policy Planning Staff, Department of State, "Memorandum for Mr. Phleger," March 28, 1955.

Source: State Department Central Decimal Files (711.5/3-2855), Record Group 59, National Archives and Records Administration, Washington, D.C.

Document II-3

Document title: Robert R. Bowie, Policy Planning Staff, Department of State, to Secretary of State, "Recommendations in the Report to the President by the Technological Capabilities Panel of the Science Advisory Committee, ODM (Killian Committee): Item 2—NSC Agenda 10/4/56," October 2, 1956.

Source: Record Group 59, General Records of the Department of State: Records Relating to State Department Participation in the Operations Coordinating Board and the National Security Council, 1947-1963, Box 87, "NSC 5522 Memoranda," National Archives and Records Administration, Washington, D.C.

In February 1955, the Technological Capabilities Panel, headed by MIT professor James R. Killian, produced a report on the threat of surprise attack on the United States. The report made a number of recommendations on how to reduce this threat, including the development of radar early warning systems and better intelligence collection methods. One recommendation was the establishment of the concept of "Freedom of Space" by first orbiting a scientific satellite before *orbiting an intelligence satellite. This recommendation resulted in the signing of NSC 5520, "Draft Statement of Policy on U.S. Scientific Satellite Program," published as Document II-10 in Volume I of* Exploring the Unknown. *Prior to the signing of this document, the Department of State was requested to study the issue and report to the National Security Council (NSC), as stated in the recently declassified top secret letter by Robert Bowie to Assistant Secretary of State Herman Phleger. The Policy Planning Staff at the Department of State continued to study the issue, along with several other recommendations in the Technological Capabilities Panel's report, and issued further reports on their status, also recently declassified from "Top Secret status," including the "Freedom of Space" recommendation. "Freedom of Space" continued to be an issue for several years after Sputnik.*

Document II-2

[no pagination] March 28, 1955

Memorandum for Mr. Phleger

At a recent meeting, the NSC considered a report to the President by a panel of the Science Advisory Committee on threat of surprise attack.

Recommendations No. 9 and B. 12b of the report read as follows:

"9. A re-examination be made of the following principles or practices of international law from the standpoint of recent advances in weapons technology:

"a. Freedom of the Seas. Radical extension of the 'three-mile limit' to permit control of surface and subsurface traffic from the coastline to beyond the likely striking range of sea-launched nuclear missiles.

"b. Freedom of Space. The present possibility of launching a small artificial satellite into an orbit about the earth presents an early opportunity to establish a precedent for distinguishing between 'national air' and 'international space,' a distinction which could be to our advantage at some future date when we might employ larger satellites for intelligence purposes."

"B. 12b. Studies should be made of appropriate changes in the concept of the 'three-mile limit' to permit actions in keeping with the threat; for realistic implementations of

any policy changes, the missions of the Coast Guard and Navy must be amended and forces increased to equal the tasks of inspection and control."

The Department of State has been requested to study these recommendations, in coordination with the Departments of Defense, Treasury, and Justice, and to submit a report and recommendations to the NSC on or about May 15, 1955.

It seems clear that L should undertake the two studies involved, working with other interested divisions and offices of the Department.

Robert R. Bowie

Document II-3

[no pagination] October 2, 1956

TO: The Secretary

THROUGH: S/S

FROM: S/P - Robert R. Bowie

SUBJECT: Recommendations in the Report to the President by the Technological Capabilities Panel of the Science Advisory Committee, ODM (Killian Committee): Item 2—NSC Agenda 10/4/56

1. The Council is asked to note the status of implementations of the Technological Capabilities Panel (TCP) recommendations on "Meeting the Threat of Surprise Attack," as presented in the several agency reports contained in NSC 5611 ("Status of National Security Programs on June 30, 1956"). Oral reports may be given to the Council by Defense, AEC, ODM, FCDA [Federal Civil Defense Authority] and CIA.

2. The draft Record of Action, which the Council will be asked to approve:

a) noted a number of changes in programs to carry out that is assigned to Defense;

b) requests Defense to supplement its Council briefing, in December, on the ICBM, with a report on the anti-missile missile program; and

c) defers decision on a follow-up study to the Killian Report, which the TCP recommended "within two years."

Defense and ODM differ as to the need for this: The Planning Board agreed to defer a recommendation to the Council until the ODM consults its Science Advisory Committee, the TCP parent, on whether technological advance in the past two years justifies initiation of another study at this time.)

3. Five TCP Recommendations were assigned as our primary responsibility by NSC Action 1355. We do not make an annual Status Report and therefore have not submitted an accounting. In the event that questions arise concerning their status, I am attaching a brief memorandum of comments you may care to use.

****

[1]

Status of Implementation of TCP Recommendations Assigned to the Department of State

General Recommendation 7 a - b - c:

"The NSC initiate preparatory studies of the problems of international negotiations in the following areas growing out of recommendations of this Report."

a. "*Atomic weapons in air defense negotiations with Canada* to provide our air defense forces with authority to use atomic warheads over Canada."

Status: Under current negotiation with the Canadian Government.

Comment: Preliminary negotiations were opened last month between the Department and the Canadian Ambassador to discuss the integration of atomic weapons in joint US-Canadian air arrangements. The Ambassador was informed of new weapons developments and their implications for air defense. We pointed out in particular that US forces must have advance authority to overfly Canada with atomic weapons and to use such weapons over Canadian territory in air defense. The conversations covered other aspects of the problem including the compatibility of Canadian aircraft for US weapons, the training of Canadian personnel, the storage of weapons on Canadian soil, and the availability of the weapons to Canadian forces. The Canadian Ambassador stressed the political sensitivity of the problem and stated that he would report to his government and reply to the US how it thought the matter might best be studied.

b. "*Extension of the Planned Early Warning Line* - International negotiations for the seaward extension of the distant Early Warning Line from Greenland via Iceland and the Faroes to join future NATO warning systems."

Status: a) *Denmark:* Under current negotiation with the Danish Government; b) *Iceland:* in abeyance pending political developments with respect to the base problem; c) *UK:* awaiting a Defense report of current conversations between the US and UK Chiefs of Staff.

[2] *Comment:* With respect to the requirements in Greenland (6 radar sites and their associated communication facilities), the Danish Foreign Office has recently granted approval for the conduct of technical and engineering surveys by US military authorities but has made clear that the approval is without prejudice to final decision of the Danish Government regarding the establish-ment location and operation of the proposed radar stations. With respect to the programmed Northwest radar site in Iceland, the present situation is obscure in view of the uncertain future status of US and NATO defense installations in Iceland. With regard to requirements in the Faroes, the Depart-ment has recently requested information from the Department of Defense of the details of these requirements in order that they may be considered from the political viewpoint. With respect to the termination of the DEW Line in the United Kingdom, the US Joint Chiefs of Staff have informed the British Chiefs of Staff of the general nature of this proposal, and are currently awaiting a reply. The Department of Defense has been requested to inform the Department of State as soon as the reply is received. The Department of State has also asked for information from Defense on the relation-ship of the proposed DEW Line extension both to SHAPE's plans and to SACLANT's plans, both of which contain NATO requirements for early warning facilities.

c. "*Remote Sea Monitor Line* - International negotiations for the installation of a submerged, sea traffic monitor line extending from Greenland to Iceland and to the United Kingdom."

Status: The Department is awaiting definitions of defense requirements, which, it understands, are now being worked out in service to service discussions.

General Recommendation 9 - b:

"*Freedom of Space* - The present possibility of launching a small artificial satellite into an orbit about the earth presents an early opportunity to establish a precedent for distinguishing between 'national air' and 'international space,' a distinction which could be to our advantage at some future time when we might employ larger satellites for intelligence purposes."

[3] *Status:* The Department's Legal Adviser has this problem under current review. State has participated with Defense, the National Science Foundation, and the National Academy of Science in planning the program for launching an earth satellite as part of the US participation in the International Geophysical Year 1957-58. Our studies are continuing in cooperation with the interested agencies.

Comment: So for as law is concerned, space beyond the earth is an uncharted region concerning which no firm rules have been established. The law on the subject will necessarily differ with the passage of time and with practical efforts at space navigation. Various theories have been advanced concerning the upper limits of a state's jurisdiction, but no firm conclusions are now possible.

A few tentative observations may be made: (1) A state could scarcely claim territorial sovereignty at altitudes where orbital velocity of an object is practicable (perhaps somewhere in the neighborhood of 200 miles); (2) a state would, however, be on strong ground in claiming territorial sovereignty up through the "air space" (perhaps ultimately to be fixed somewhere in the neighborhood of 40 miles); (3) regions of space which are eventually established to be free for navigation without regard to territorial jurisdiction will be open not only to one country or a few, but to all; (4) if, contrary to planning and expectation, a satellite launched from the earth should not be consumed upon reentering the atmosphere, and should fall to the earth and do damage, the question of liability on the part of the launching authority would arise.

General Recommendation 2B - 12-a:

"We recommend that comprehensive programs be instituted to provide effective control of surface and, so far as possible, sub-surface traffic in both oceans from the coastlines to beyond the likely striking range of sea-launched attacks. For proper implementation:

"a. international arrangements should be made for the establishment of information reporting procedures and of control measures."

[4] *Status:* The Department is awaiting the results of other studies, assigned to Defense, which will bear on the scope and type of the "international arrangements" desired. It is our understanding that Defense has recently consulted with Treasury to ascertain whether international arrangements for search and rescue operations could be expanded to satisfy defense requirements.

Document II-4

Document title: Percival Brundage, Director, Bureau of the Budget, to the President, "Project Vanguard," April 30, 1957.

Source: Bureau of the Budget Files, Dwight D. Eisenhower Library, Abilene, Kansas.

Project Vanguard was the result of NSC 5520 and was intended to establish "Freedom of Space"—the right to overfly foreign territory for future intelligence satellites. The initial estimate of its cost was $15 to $20 million, but by mid-1956 the program was already over budget, and estimates of its total costs continued to grow. In April 1957, the Director of the Bureau of the Budget, Percival Brundage, wrote President Eisenhower explaining the costs of the program and where additional funding had been found. His memorandum provides a good insight into the close relationship between the National Academy of Sciences and the Department of Defense. It also indicates that $2.5 million for the Scientific Satellite Program came from the Central Intelligence Agency. Finally, Brundage notes that work on the Air Force reconnaissance satellite was funded for the next fiscal year and that if the Vanguard satellite was not completed, satellite research would still continue.

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[1] April 30, 1957

Memorandum for the President

Subject: Project VANGUARD

The Department of Defense advises that developmental difficulties requiring additional time and effort have resulted in further revision of the estimated total cost of Project VANGUARD and that it will not be possible to complete the presently authorized six vehicle project within the January estimate of $83.6 million for the total cost. Arrangements have been made to fund approximately $70 million to date. Of this amount, some $50 million is being provided by the Department of Defense for the launching vehicles and related activities, of which $25 million was advanced from the fiscal year 1957 Department of Defense emergency fund and has not been replaced. A fiscal year 1956 supplemental appropriation for the National Science Foundation has provided funds for the satellites themselves and the scientific instrumentation and ground observations.

We have been advised that it is currently estimated that if no further major developmental problems are encountered, the project may be completed within a total of $110 million. With respect to the probability of success of the project within this level of funding, the Department of Defense has reviewed and reconfirmed its statement to the National Security Council at the meeting of January 24, 1957, that in the technical judgment of Defense scientists and their consultants at least one successful satellite should result from six launchings of the presently planned Project VANGUARD launching vehicle. Since arrangements have been made to fund approximately $70 million, an additional amount of $40 million would be required to complete the project on present assumptions.

While no further major technical difficulties are now anticipated, it must be recognized that flight tests have not yet been completed. We have been advised that in the event unforeseeable developments should make it necessary to incorporate fundamental changes in the present approach or to employ an alternative approach, substantial additional funds beyond the $110 million estimate might be required.

When continuation of the policy established under NSC 5520 [was] considered at the NSC meeting of May 8, 1956, it was decided that this policy should be continued "with the understanding that the program developed thereunder will not be allowed to interfere with the ICBM and IRBM programs but will be given sufficient priority by the Department of Defense in relation to other weapon systems to achieve the objectives of NSC 5520."

The use of Department of Defense emergency funds in late fiscal year 1956 as well as during fiscal year 1957 was necessary because costs of [2] development and procurement of the launching vehicles increased much higher than the original estimate. The Central Intelligence Agency had made $2.5 million available to the Department of Defense, and the National Science Foundation was able to transfer $5.8 million when the decision was made to plan for no more than six launchings. It is the position of the Department that use of its funds was not based on any understanding by the Department that it had a continuing responsibility for funding this project but rather that the Department has used its funds thus far because no other clear-cut assignment of responsibility for funding the launching vehicles has been made and because it was assured that funds advanced to this project would be replaced, at least insofar as advances were made from fiscal year 1957 funds.

The Secretary of Defense has now concluded that it is not advisable for the Department to provide further support of the project in fiscal year 1957 or future years from the emergency fund. In addition to the fact that the Department does not consider that it has a continuing responsibility for the project, the Secretary's position is understood to result from the fact that the Department has not been reimbursed for fiscal year 1957 emergency funds already provided as well as from congressional criticism of the use of emergency funds for this purpose. In this connection it is noted that in view of established fiscal policies limiting supplemental appropriations to the most urgent cases, the Bureau of the Budget recently disapproved a request of the Department of Defense to reimburse the emergency fund.

The Bureau of the Budget has reviewed this problem with staff of the Department of Defense and the National Science Foundation. From the evidence at hand, the Bureau of the Budget believes that the project cannot go forward without additional funding. Taking into consideration the fact that this project has all the elements of a guided missile development program together with additional problems of a novel and difficult character, it is not surprising that substantial cost increases have occurred. However, inasmuch as the Department is now well into the project and states that it has already resolved a number of the technical problems, the present estimate of $110 million may be more reliable than previous estimates.

On the other hand, in the light of past experience with this project and in the absence of flight test results confirming the soundness of the present approach, I believe that it should be recognized that the cost of the project may be as high as $150 to $200 million. In weighing the benefits deemed to be derived from the project and its priority in comparison with all the other current projects, it was initially approved in the expectation that the cost would be between $15 and $20 million. I question very much whether it would have been authorized, at least on a crash basis, if the actual cost had been known at that time.

[3] It is hoped that in the future more careful estimates will be made as to the total cost or range in possible costs before such projects are initially approved. Furthermore, this seems to offer an opportunity to give up a desirable project for something else which is considered to be of higher priority in relation to cost and benefits to be derived. We are presently developing nine intercontinental and intermediate missiles with a range of over 1,000 miles, some of which involve comparable techniques and which will require difficult

priority decisions as to programming and funding. Some eliminations will have to be made.

The Department of Defense has indicated interest in this program to about the same degree it has shown on some other basic research projects, but has stated that its interest is not sufficient to justify the project's continuance with Department of Defense financing. Therefore, the Department believes that the program must be justified on the basis of the several national objectives stated in NSC 5520 rather than on the Department's interest.

The Department of Defense believes that to prosecute the balance of the program successfully, adequate financing should be arranged by supplemental requests submitted for appropriation to the National Science Foundation, which the Department considers to be the sponsor of the program. The Department would assist in justifying the supplemental requests of the National Science Foundation by assuming the burden of justification as to the technical difficulties encountered and the cost elements involved.

It should be noted that one of the important considerations has been and is the completion of the project during the period of the International Geophysical Year. If you desire the project to be continued in accordance with the existing policy under NSC 5520, it is suggested that the following actions could resolve the current financing problem:

1. The Department of Defense should be directed to provide immediately $5.8 million from the emergency fund to continue the project from May 1 through approximately August 1. The Department feels it must clear this use of the emergency fund with the Appropriations Committees who have questioned the propriety of its use for this purpose. It should be recognized that the Department would prefer that these funds be replaced.
2. A fiscal year 1958 budget amendment should be submitted requesting an additional $34.2 million for appropriation to the National Science Foundation to cover costs to completion of the project, assuming that current cost estimates are valid, that no further major difficulties are encountered in the course of completing the development, and that the [4] Department of Defense would continue to provide general support for which no special funding has been considered necessary. Upon availability to the National Science Foundation these funds would be transferred to the Department of the Navy to complete the program.

The National Science Foundation believes that in view of the national interests involved the program cannot be permitted to fail at this stage. If it were the only possible alternative to cancellation of the project, the National Science Foundation would consider it necessary in the total national interest to request a supplemental appropriation to cover the costs required to complete the responsibilities undertaken by the Department of Defense under NSC 5520. Moreover, the National Science Foundation recommends that the Department of Defense provide the necessary funds to complete the project for the following reasons: (1) the Department of Defense is responsible under the present terms of NSC 5520 for the portion of the program requiring additional funds; (2) the Department of Defense is best qualified to justify to the Congress the reasons for present cost increases.

Apparently, both the Department of Defense and the National Science Foundation are very reluctant to continue to finance this project to completion. But each is quite prepared to have the other do so.

General Cutler believes the following considerations are particularly relevant to a decision in this matter:

"1. The substantive scientific information concerning upper atmospheres which might be acquired by the launching of a successful satellite. Included in this information would be data as to the content of the upper atmosphere (such as invisible

heavenly bodies) through which the very costly intercontinental ballistic missiles, if perfected, must pass.

"2. The world reaction to an abandonment by the U.S. in mid-stage of the satellite program. A conclusion that the richest nation in the world could not afford to complete this scientific undertaking would be unfortunate. Even more unfortunate would be an inevitable inference that American scientists were not up to bringing the project to a successful conclusion.

"3. The reaction of the scientific community to the abandonment by the U.S. in mid-stage of the satellite program. A time when the Free World is coming more and more to depend on advanced technology and scientific accomplishment is not a time to alienate the scientific community at home and lead it to believe that the Government has lost faith in scientific accomplishment. [5] From what I hear and read, the scientific community and those in highly technical industry who work with them are already sensitive in this regard.

"4. A final decision on the satellite program should be made by the President on an integrated presentation of the views of all concerned in this matter. The integrated process of presentation, such as is illustrated in the National Security Council, is a primary achievement of this Administration. Where so much, beyond financial considerations alone, is at stake, the President should have the benefit of an integrated presentation and discussion. This point of view is important, irrespective of what the President's decision might ultimately be."

It should be noted that the Air Force has already started its own project for a much larger reconnaissance satellite vehicle and is spending approximately $10 million in fiscal year 1957 and is currently planning additional funding of at least $10 million for fiscal year 1958. Therefore, whether or not the International Geophysical Year satellite project is completed, research in this area will not be dropped.

Percival Brundage
Director

Document II-5

Document title: Lieutenant General Donald L. Putt, Deputy Chief of Staff, Development, U.S. Air Force, to Dr. Hugh L. Dryden, Director, National Advisory Committee for Aeronautics, January 31, 1958.

Document II-6

Document title: Gen. Donald L. Putt, to Commander, Air Research and Development Command, "Advanced Hypersonic Research Aircraft," January 31, 1958.

Document II-7

Document title: General Thomas D. White, Chief of Staff, USAF, and Hugh L. Dryden, Director, NACA, "Memorandum of Understanding: Principles for Participation of NACA in Development and Testing of the 'Air Force System 464L Hypersonic Boost Glide Vehicle (Dyna-Soar I),' " May 20, 1958.

Source: All in NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

Even before NASA was created, the Department of Defense (DOD) and National Advisory Committee for Aeronautics (NACA) were cooperating on space-related developments. The letter from Lt. General Putt, Air Force Deputy Chief of Staff, Development, opened the possibility for NACA participation in a potential X-series aircraft with the qualities of both a spacecraft and an airplane. Technically a hypersonic boost-glide vehicle, its flight characteristics were termed "dynamic soaring" for its ability to skim the thin air of the upper atmosphere. It was given the nickname of "Dyna-Soar." While the motivation from the DOD side was the development of technologies for an orbital bombing aircraft and related missions, NACA participation was intended to benefit civil applications. Dyna-Soar was not covered in the original agreements creating NASA that outlined transferring or sharing programs with DOD. Dyna-Soar's importance was its demonstration of the possibility of joint development of a major new system, despite widely differing reasons for cooperation. Although the program was canceled in 1963 for technical and cost reasons, it set a precedent for future cooperation.

Document II-5

[1] 31 January 1958

Dr. Hugh L. Dryden
Director
National Advisory Committee for Aeronautics
1512 H Street, N.W.
Washington 25, D.C.

Dear Dr. Dryden:

In the last few months the dimensions of the contest for superiority in aircraft and missile technology have suddenly and drastically expanded.

This letter is addressed to a particularly important event in this contest—the matter of a research vehicle program to explore and solve the problems of manned space flight. Specifically, the Air Force is convinced that we must undertake at once a research vehicle program having as its objective the earliest possible manned orbital flight which will contribute substantially and essentially to follow-on scientific and military space systems.

The Air Force has set up a design competition for a hypersonic boost glide vehicle nicknamed Dyna Soar I. The objectives of this program closely conform to the recommendations of the NACA report of last summer. It appears probable that this vehicle will be able to orbit as a satellite since the aerodynamic heating problems of re-entry appear less severe than those of the Dyna Soar I flight profile. However, it may be feasible to demonstrate an orbital flight appreciably earlier with a vehicle designed only for the satellite mission than would be possible with a vehicle capable of the boost-glide mission as well. It is necessary, therefore, to determine whether a research aircraft designed only as a satellite will give us an orbital flight of technical significance enough sooner than a vehicle designed for the glide mission to warrant a separate development.

Both the NACA and the Air Force are well along in investigations seeking the best approach to the design of a manned earth orbiting research vehicle. We earnestly believe that these efforts should be joined at once and brought promptly to a conclusion. Accordingly the NACA is invited to collaborate with the Air Research and Development Command [ARDC] in this important task. Because of the advanced stages to which the individual NACA and ARDC investigations have already [2] progressed and because of the urgency of getting on with the job, we believe that the evaluation should be confined to

existing and planned projects, appropriate available proposals, and competitive approaches already under study. We visualize that any program growing out of this joint evaluation will best be presented, managed and funded along the lines of the X-15 effort, with the Navy being brought into the picture as soon as possible without delaying the evaluation.

To provide further insight into Air Force thinking on this matter, the concluding paragraphs of the letter directing ARDC to make this evaluation are quoted:

"4. . . . it is desired that the evaluation consider separately the following approaches:

"a. What is the best design concept, the minimum time to first orbital flight and the dollar cost of demonstrating a manned one-orbit flight in a vehicle capable only of a satellite orbit? Time is a primary consideration, but to qualify, an approach must offer prospects of tangible contributions to the over-all astronautics program.

"b. What is the minimum time to first orbital flight and dollar cost of demonstrating a manned one-orbit flight with a vehicle designed to utilize the boost-glide concept? In this approach it is not necessary that the first orbit flight be made within the atmosphere if an "outside" orbit offered the possibility of an earlier successful flight.

"5. The following additional guidance is provided:

"a. The program to meet the stated objective should be the minimum consistent with a high degree of confidence that the objective will be met. Maximum practical use must be made of existing components and technology and of the momentum of existing programs.

"b. The hazard at launch and during flight will not be greater than that dictated by good engineering and flight safety practice. If feasible, in order to save time and money, pilot safety may be provided by emergency escape systems rather than insisting on standards of component reliability normally required for routine repetitive flights of weapon systems. This statement is particularly pointed at the problem of qualifying boosters for initial orbital flights.

"6. It is requested that this Headquarters be furnished the results of your evaluation of each of the approaches specified in paragraph 4. Finally, your over-all conclusions and recommendations for accomplishing the objective stated in paragraph 1 are desired.

[3] "7. The requested information should be forwarded at the earliest practicable date, but in no event later than 15 March 1958."

It is hoped that the Air Force-NACA team relationship which has proven so effective in earlier programs of the X-airplane series can be continued in the conception and conduct of this and other research vehicle programs directed to the extension of our knowledge and capability in upper atmosphere and space operations.

We look forward to receiving your comments and suggestions to this proposed course of action.

Sincerely,

D. L. Putt
Lieutenant General, USAF
Deputy Chief of Staff, Development